Alternative Access to South Whiskey Island Feasibility Study

City of Cleveland

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CITY OF CLEVELAND
Mayor Frank G. Jackson

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1. Executive Summary

South Whiskey Island is a peninsula located in downtown Cleveland at the mouth of the Cuyahoga River and is home to major industries that have great impact upon the local and regional economy. The only vehicular access is by the Willow Avenue Vertical Lift Bridge that carries up to 1,000 trucks per day during peak seasons and is raised on average 30 times a day to allow lake freighters, work boats and pleasure boats to travel underneath with 100' of vertical clearance. With the completion of the Wendy Park Bridge, the Willow Lift Bridge also fills a critical gap in the active transportation network by linking Wendy Park on the lakeshore to a growing network of trails in downtown Cleveland.

The Willow Lift Bridge, constructed in 1965, is at the end of its design life and requires major rehabilitation or replacement. It spans the Cuyahoga River Old Channel (Old River) and is raised to allow vessels to travel underneath. The Old River supports navigation by large lake freighters and is dredged to a depth of 23 feet by the U.S. Army Corps of Engineers under the Cleveland Harbor Authorization. Bridge operators are needed on site 24 hours per day, every day of the week. When the lift bridge malfunctions, it can be left in the "down" position blocking vessel traffic and incurring daily fines assessed by the U.S. Coast Guard, or in the "up" position blocking road traffic. The truck route to reach the Willow Lift Bridge adjoins residential areas and the Cuyahoga Metropolitan Housing Authority (CMHA) Lakeview Terrace causing concerns with air quality, truck frequency and truck route enforcement. When blocked traffic queues or detours through the adjoining areas, additional dust, fumes, noise, congestion, and delays aggravate the situation.

There is an immediate need for a reliable access route to South Whiskey Island that would alleviate air quality and mitigate the effect of industrial uses upon residents, while providing desired multi-modal access. AECOM was contracted by the City of Cleveland (City) Division of Engineering and Construction to study the feasibility of alternative access routes to South Whiskey Island and to develop a preferred long-term solution/alternative for the rehabilitation or replacement of the existing Willow Avenue Vertical Lift Bridge. The study limits are shown on the existing conditions map located in **Appendix A**. The findings, existing conditions and stakeholder coordination are as of December of 2019.

Within this study, AECOM evaluated 2 temporary and 36 permanent alternatives to provide reliable access to South Whiskey Island. Coordination with multiple stakeholders was key to identifying viable solutions. Businesses that line either and/or both sides of the Old River have major regional economic impact and include Cargill Deicing Technology, Ontario Stone Corporation, Canadian Silica Industries (Csi) formerly Sand Products Corporation, The Great Lakes Towing Company, Ivancic Marine which includes the Channel Park Marina, and the Olde River Yacht Club. Cargill, Ontario Stone and Csi are the three prominent businesses on South Whiskey Island. They distribute salt, sand and gravel throughout Ohio, western Pennsylvania, and southern Michigan. The largest of the businesses is Cargill, which owns and operates a salt mine under Lake Erie, accessed from South Whiskey Island. The mine can produce 4 million tons of rock salt each year and employs over 200 people on site. All businesses along the Old River rely on access to lake vessels and trucks, and some also require access to trains.

Norfolk Southern Railroad (NS) tracks bisect Whiskey Island, isolating the north from the south. The busy lakefront line is used by NS, CSX Railroad, and Amtrak to convey freight and passengers between Chicago IL and Buffalo NY. Spur lines are used to service businesses on South Whiskey Island, as well as the Bulk Terminal Facility of the Port of Cleveland on North Whiskey Island. Other stakeholders impacted by the fate of the Willow Lift Bridge are those sharing the confined land north of the Cleveland Memorial Shoreway (US20/SR6), west of the Cuyahoga River and south of Lake Erie. They include the Westerly Wastewater Treatment Plant, owned and operated by the Northeast Ohio Regional Sewer District (NEORSD), the Garrett A. Morgan Water Treatment Plant operated by the Cleveland Water Division (CWD), the electric substation operated by Cleveland Public Power (CPP), the Cleveland Area Soap Box Derby, owners and operators of tour/recreational boats and of commercial lake freighters, tugs, and barges (many represented by the Lake Carriers' Association), and the Cleveland Metroparks, owners and operators of Wendy Park, the Wendy Park Bridge, and the Wendy Park Connector Trail.

Of the alternatives evaluated, four permanent alternatives were selected for further consideration. Detailed plans of the selected alternatives are shown in **Appendix B** and detailed plans for the remaining alternatives are shown in **Appendix C**. The selected alternatives are as follows:

- Alternative 4 – Existing Willow Avenue Lift Bridge Rehabilitation
- Alternative 15 – New Lift Bridge Adjacent to Existing
- Alternative 16 – New Bascule Bridge at Mulberry Avenue
- Alternative 36 – New Fixed Bridge at State Street

These four (4) alternatives were evaluated based upon criteria selected by AECOM, MCDA and the City. Eleven (11) criteria were utilized and are as follows, in alphabetical order:

- Accessibility During Construction
- Cost, Total (Project Cost + Operation & Maintenance)
- Design Considerations
- Environmental Impact
- Implementation Schedule
- Life Expectancy of Alternative
- Major Area Industrial Business Impact
- Multi Modal Transportation Access
- Railroad Impact
- Safety
- Stakeholder Considerations

To be considered, each alternative had to meet the purpose and need, receive support from Norfolk Southern Railroad and allow a feasible method to maintain access to South Whiskey Island while constructing the alternative. Preliminary NS approval was sought during the feasibility study phase because they control land and access, and without their support the project could be at risk for significant schedule delays and design rework. If the alternative did not meet these criteria, the alternative was not considered any further.

In addition to infrastructure improvements, the project seeks to mitigate or improve environmental concerns such as air quality, dust, and noise. Although these are typical byproducts of industrial sites, the project will investigate mitigation or amendment to a reasonable level to improve quality of life for residents in proximity to industry.

In lieu of a decision matrix spreadsheet, the Multi-Criteria Decision Analysis (MCDA) tool was utilized for selection of the preferred alternative. MCDA is a methodology within the field of Operations Research. MCDA synthesizes information of a complex and conflicting nature by taking explicit account of multiple criteria, some of which may be intangible.

The decision problem was modeled by developing a hierarchical framework that represents the project evaluation criteria using a multi attribute value theory (MAVT) based model. For each alternative, scales, and ranges for each of the measures were determined. The scores for each alternative under each of the identified measures of performance were determined as shown in **Appendix D**.

As described herein and computed in the Multi-Criteria Decision Analysis, AECOM recommends **ALTERNATIVE 36 – New Fixed Bridge at State Street** as the preferred alternative. As envisioned, the non-movable State Street Bridge has a length of 2,400', spans 100' above the Old River and has an estimated construction cost of $52 million (2024). Preliminary design of this alternative should be progressed forward to allow full evaluation of environmental concerns and their mitigation.

2. Introduction and Purpose of Study

AECOM was contracted by the City Division of Engineering and Construction to study the feasibility of alternative access routes to South Whiskey Island and to develop a preferred long-term solution/alternative for accessing South Whiskey Island. A bridge has existed at this location since before 1874. A swing bridge was in place prior to the current Willow Avenue Vertical Lift Bridge. The current lift bridge, built in 1964, is one of the last movable bridges to be built in the City. This bridge is becoming unreliable and is the only vehicular access to South Whiskey Island. The Willow Avenue Lift Bridge is nearing the end of its useful life and would require major rehabilitation or replacement. Operation and maintenance continue to become more and more costly as demonstrated by the following:

- The bridge has required significant ongoing expenditures to maintain, with rehabilitation projects in 1987 and 2010.
- The lift cables were more recently replaced in 2018. Load restrictions were imposed in 2017.
- Recent repairs done to the bridge have been completed and required a complete closure.
- In the past 10 years, the City has invested approximately $9.8 million in capital repairs (not including maintenance items and operating costs) on the Willow Avenue Vertical Lift Bridge.

South Whiskey Island is bound on the north by the Norfolk Southern (NS) railroad mainline tracks and on the south, east and west by Old River. The project limits of this feasibility study include South Whiskey Island and extend west and south to the Cleveland Memorial Shoreway/US20/SR6 (Shoreway), west to the Cuyahoga River and north to Lake Erie as shown on the existing conditions map in **Appendix A**.

The existing Willow Avenue Vertical Lift Bridge spans Old River near the confluence with the Cuyahoga River. This vertical lift bridge is raised to allow vessels to travel underneath. It serves the businesses along South Whiskey Island and will soon carry the Cleveland Metroparks bike and pedestrian traffic to Wendy Park upon completion of the Wendy Park pedestrian bridge over NS, currently under construction. The bridge is staffed 24 hours a day and 365 days a year with a full-time operator to raise and lower the structure, as required by the United States Coast Guard (USCG).

The purpose of this project is to explore feasible access routes onto South Whiskey Island to provide reliable access for the 500 to 1,000 trucks per day that use this route and to provide access to the additional vehicular traffic generated by approximately one thousand employees that work on site. The only point of public access for the traffic is the Willow Avenue Lift Bridge which currently has load restrictions that cannot be removed without extensive rehabilitation. Therefore, the City desires a short-term temporary access route to South Whiskey Island along with a long-term solution for the Willow Avenue Lift Bridge to improve mobility and access in order to support planned community growth and development.

In addition to infrastructure improvements, the purpose of this project is to mitigate or improve environmental concerns such as air quality, dust, and noise. Although these are representative of residences placed near an industrial site, the project will investigate mitigation or improvement to a reasonable level to improve quality of life for residents due to their proximity to industry.

Maintaining access to South Whiskey Island and Old River, west of the existing bridge, has a regional impact. Businesses along either and/or both sides of the Old River include Cargill Deicing Technology (Cargill), Ontario Stone Corporation (Ontario Stone), Canadian Silica Industries Inc. (Csi) (formerly Sand Products Corporation), The Great Lakes Towing Company (Great Lakes Towing), Ivancic Marine, Channel Park Marina and Olde River Yacht Club.

Cargill, Ontario Stone and Csi are the three prominent businesses residing on the island that use the existing Willow Avenue Lift Bridge to distribute their goods. They distribute salt, sand and gravel throughout Ohio, western Pennsylvania and southern Michigan.

All modes of transportation were accounted for in the evaluation and include trucks, passenger cars, vessels on Old River and pedestrians/bicyclists.

The feasibility study is 100% locally funded and has been conducted in accordance with the Ohio Department of Transportation (ODOT) Project Development Process (PDP). This will be considered a complex Path 3 project.

The study does not include preparation of detailed construction documents or right of way plans.

The alternatives analysis has been conducted to a preliminary engineering level of detail to arrive at a preferred alternative which best meets the project Purpose and Need while implementable. Additional design development will be required to implement the recommended alternative(s). The study has generally relied on readily available GIS basemapping data and secondary sources. The property line and ownership information is based on Cuyahoga County GIS. Full title research was not performed. While no project-specific geotechnical investigations were performed at the time of this study, AECOM has previously implemented several geotechnical investigations in the general area of the project. This information along with historical boring data from the original construction of the bridge were incorporated. Several baseline environmental studies, both desktop and in the field, were conducted of existing conditions within the study area. Alternative alignments were then overlaid on the mapping resulting from these studies to estimate the environmental impacts of each alternative. The findings, existing conditions and stakeholder coordination are as of December of 2019.

3. Existing Conditions

As shown on the existing conditions map in **Appendix A**; there are City entities, other government agencies, businesses, residences, and environmental features within the project study limits. These were the findings and conditions as of December of 2019.

3.1 Major Area Industrial Businesses

Cargill, Ontario Stone and Csi are the three prominent businesses residing on the island that use the existing Willow Avenue Lift Bridge to distribute their goods. They distribute salt, sand and gravel throughout Ohio, western Pennsylvania and southern Michigan. Maintaining access to South Whiskey Island and Old River, west of the existing bridge, has a regional impact.

Cargill Deicing Technology

Cargill is located on the west side of South Whiskey Island and occupies most of the property on the island. Their operations increase during winter months and during fall and spring when salt stockpiles are replenished for use by city, county and state customers. In addition to trucking, Cargill also relies on Old River and rail to support their business. See the existing conditions map in **Appendix A**.

Cargill mines salt from approximately 2,000 feet beneath the bottom of Lake Erie and then distributes by ship, rail and truck. Based on the capacity to haul, Cargill's priorities are first ship then rail and truck. The mine stretches approximately 5 miles wide and 3 miles out from shore. They mine, process and transport bulk deicing salt to municipalities, government agencies and private commercial businesses. They extract as much as $4 million tons of salt each year from the Cleveland mine and sell as far as Minnesota and Massachusetts. Ohio is the fifth biggest producer of salt in the county and their Cleveland mine produces the most. They anticipate another 50 years of mining, but the mine could conceivably go on forever, expanding to the Canadian border at a minimum.

In general, trucks access the Cargill property by crossing the Willow Avenue Lift Bridge then continue west where they weigh-in at the scales. Trucks then go northwest and continue counterclockwise around the portion of the property housing the mining and office buildings. The trucks are loaded and then loop back to the scales and cross back over the Willow Avenue Lift Bridge. Winter is peak season for Cargill trucking operations and during this time they will distribute 600 to 800 trucks per day. Outside of peak season typically 100 to 200 trucks per day. They use third party trucking companies. In addition, it is important for Cargill to haul in supplies to support mining operations. For example, explosives are typically delivered to the site with police escort. Cargill relies on the Willow Avenue Lift Bridge being lowered to access their property by vehicle and raised to access their property by ship.

The rail spurs operated by NS on Cargill property are used for rail car storage and loading salt for rail distribution. Each rail car can hold approximately 110 tons.

The ships use Old River to access Cargill property by water. The ships align along the west side of the boat slip to fill. The eastern side of Cargill property contains inventory piles. The approximately 100 ships per year are active from April 1st to end of December.

Cargill's facility must abide by the Mine Safety and Health Administration (MSHA) regulations. All people performing tasks on this site must be MSHA certified. In addition, while a ship is docked at their site, they are considered an international port. During these times the site must comply with Maritime Security (MARSEC), which is a requirement of the USCG and Department of Homeland Security.

Ontario Stone Corporation

The main dock and general offices for Ontario Stone are situated on the east end of South Whiskey Island, north of the Willow Avenue Lift Bridge. Ontario Stone also owns property along the south side of the Old River between Great Lakes Towing and the existing Willow Avenue Lift Bridge. This property runs parallel with River Road. See the existing conditions map in **Appendix A**.

The trucks access the north property by crossing the Willow Avenue Lift Bridge then continue straight to their stockpiles, main office and service garage buildings. Trucks access the south property off River Road prior to crossing the bridge. The south property contains stockpiles, a trailer and scales. The stockpiled material on the southern property makes up approximately 75% of Ontario Stone's total stockpiled material.

Ontario Stone is Northeast Ohio's largest distributer of crushed limestone products and employs approximately 50 people. During the construction season, their peak season, operation includes 40 to 50 trucks from the north property. These trucks distribute the material stockpiled on the north property, which requires the Willow Avenue Lift Bridge. To reduce dust, they water down often. Ontario peak season is offset from Cargill's. Operation of their material is simple, they do not process or screen onsite. Ontario offers 35 different products. Therefore, both properties are used to prevent cross contamination of materials.

In addition to trucking, Ontario Stone also relies on Old River to support their business. They ship in stone, stockpile then truck off-site. At least one delivery by ship per week and sometimes two per week. Shipping delivery is 24 hours a day and 7 days a week. Ships are active from April 1st to end of December.

No rail is used. At one time there was an NS mainline at-grade crossing north of the bridge but no longer exists.

Ontario recently provided easements for the new Cleveland Metroparks bridge. Ontario relies on the Willow Avenue Lift Bridge being lowered to access their north property by vehicle and raised to access their south property by ship.

Similar to Cargill, Ontario Stone's facility must abide by the MSHA regulations and comply with MARSEC.

Canadian Silica Industries Inc.

For reference, Csi was previously known as Sand Products. Sand Products had been located here since the 1950's.

Csi is located on the southern tip of South Whiskey Island along Old River. Cargill property borders to the north and Ontario Stone to the east. The trucks access their property by crossing the existing Willow Avenue Lift Bridge, turning left, then continuing west along a shared drive with Cargill. The drive continues through Ontario Stone property to Csi's property. Their facility is focused on both fine and course foundry sand for mainly industrial use. In addition to trucking, Csi also relies on Old River to support their business. See the existing conditions map in **Appendix A**.

Their facility is fully reliant on Great Lakes freighters and receive 10 to 17 vessels on Old River per year. From the vessel, the sand is sent by conveyor to their site, dried and stored in silos then trucked offsite. Each load brought in by vessel is approximately 250,000 tons. The sand is hauled up to approximately 170 miles from their site. Their current customers only receive product by truck, so they do not use rail.

The facility has a very limited footprint with minimal room for expansion. Reliability of the existing Willow Avenue Lift Bridge is critical to the success of their business. The amount each truck can haul has been scaled back due to the condition of the bridge. Approximately 16 trucks per day cross the bridge from their facility.

Csi's facility must also abide by the MSHA regulations and comply with MARSEC.

3.2 Norfolk Southern Railroad

In general, the NS mainline railroad tracks run along an east-west corridor. As shown on the existing conditions map (**Appendix A**), these NS mainline railroad tracks cut off vehicular access to the southern portion of Whiskey Island. These busy mainline tracks run 24 hours per day and 365 days per year. The majority of NS rail traffic between Chicago and New Jersey utilize these mainline tracks. NS runs approximately 90 trains per day on these tracks. There are alternate routes for these tracks, but those routes often involve other rail companies.

The mainline tracks cross the Cuyahoga River east of the project study area with a vertical lift bridge named the Iron Maiden. Similar to the Whiskey Island Lift Bridge, an operator is required at all times. NS will do partial lifts of this bridge to save time. A full lift cycle takes approximately 20 minutes to complete. There is also 1 train per week that loads in the Port of Cleveland Bulk Terminal (Bulk Terminal). Logitech, a Canadian company, is now the terminal operator at the Bulk Terminal. NS works closely with them at this location and many others. Stone is currently the only product Logitech/NS move off Lake Erie by rail. Cargill also utilizes NS to distribute their salt by rail via these mainline tracks. There are a series of siding tracks located on Cargill's property which are operated by NS.

NS does not require flagmen for their own operations since they are familiar with the tracks and safety requirements. Any other outside party would require flagmen.

3.3 Adjacent Land Owners

Adjacent land owners are the property owners within the project study limits, except ones located on South Whiskey Island discussed within the major area industrial businesses section.

Cleveland Metroparks

The Cleveland Metroparks (Metroparks) owns Wendy Park, which is situated between the Whiskey Island Marina, Lake Erie, NS mainline tracks and the Cuyahoga River. The goal of the Metroparks is to provide a connection from Centennial Trail Lake Link to Wendy Park. Also, complete the connection between the Wendy Park Bridge to Edgewater Park and the Cleveland Lakefront Bikeway. See the existing conditions map in **Appendix A** for the trail layouts.

With their current improvements, they have commitments to the Federal government for 10 years because of the Federal funding they were provided. Since 2013, the Metroparks has worked closely with stakeholders to make significant gains on a livable lakefront.

The Metroparks own the pedestrian and Whiskey Island Drive bridges over the Bulk Terminal tracks. NS owns Whiskey Island Drive (also known as Ed Hauser Way) but they have provided the Metroparks with an easement from Ivancic Marine to Wendy Park.

The Centennial Trail Lake Link currently ends at the northeast corner of Mulberry Avenue and River Road. The last link planned to connect the trail to Wendy Park is from this point, north along River Road, across the Willow Avenue Lift Bridge to the new Wendy Park Bridge. For additional information the Centennial Trail Lake Link and Whiskey Island Connector projects, see **Section 3.10**.

The Metroparks also own and operate Edgewater Park, which is located immediately outside the western edge of our study limits. The roundabout at the West 73rd Street exit off the Shoreway was newly constructed and serves Edgewater Park and Whiskey Island Drive. The Edgewater roundabout was designed to accommodate 50 trucks per day. Edgewater Park sees approximately 1.5 million visitors and had been included on a master plan for the last 30 years. Edgewater Park includes Section 6(f) restrictions with a blanket easement while Wendy Park does not.

Metroparks codes apply on all their property, including truck weight limits.

Cuyahoga Metropolitan Housing Authority

Cuyahoga Metropolitan Housing Authority (CMHA) operates Lakeview Terrace and Lakeview Tower residences located between River Road, the Shoreway, Mulberry Avenue and the Cleveland Water Department Treatment Plant. This complex has historic significance as it was completed in 1937 and is internationally known as a landmark in public housing.

Between Lakeview Terrace and Lakeview Tower there are nearly 700 residents total. There are approximately 475 at Lakeview Terrace and 200 at Lakeview Tower. RTA bus route 81 currently service these residences.

The Great Lakes Towing Company

Great Lakes Towing and Great Lake Shipyard are part of The Great Lakes Group, a full-service marine transportation organization made up of a group of marine-related companies operating on the Great Lakes. They operate the largest U.S. flag tugboat fleet with significant marine operations in North America's U.S. Great Lakes-Saint Lawrence Seaway marine transportation network. Towing services include ship assist, cargo transportation and logistics, ice breaking, and emergency assistance of every kind of vessel, barge, and marine structure. Great Lakes Shipyard is a full-service shipyard for new vessel and barge construction, fabrication and maintenance. Our reference to Great Lake Towing includes both the towing and shipyard.

Great Lakes Towing is located off Division Avenue along the south side of Old River, across from Cargill and the marinas. Once the project is complete, Great Lakes Towing will have access to their facility through public right of way. Great Lakes Towing maintains security of their own site with a fence and gates for access off Division Avenue. Additional parking is permitted between Division Avenue and Crescent Avenue, west of CWD's underground reservoir. Their facility typically has four tractor trailers per day accessing their site from West 45th Street. Largely oversized vehicles are required to access off River Road through CWD property. All trucks are required to exit off the Shoreway at West 49th Street if westbound on the Shoreway. According to the signage on the Shoreway, trucks are not permitted any further west on the Shoreway than West 49th Street.

Ship yard work, to repair and maintain vessels, typically takes place between January to April with minimal work during the summer. Their new building to house this indoor work in the winter, stands approximately 80 feet tall. Vessels accessing their facility from Old River can dock at their slip either way but typically back in. The large vessels they have outside and onsite require a height up to approximately 90 feet. Their largest travel lift, known as "Big Blue", moves back and forth so any crossing over their property would require at least an 80-foot clearance. They currently dock their working tug boats behind Tower City, so they have reliable access to reach their customers quickly.

The Cleveland Water Department

The Garrett A. Morgan Water Treatment plant (WTP), operated by CWD, is the oldest treatment facility within the Cleveland Water system and has the largest Ohio EPA approved capacity of 150 million gallons, pumping an average of 60 million gallons of water a day. The WTP services residents and businesses located downtown and in the western and south suburbs of Cleveland. Located south of Old River between River Road and the Shoreway, the WTP property is bound on the east by CMHA Lakeview Terrace and Lakeview Tower residences and extends westerly towards West 53rd Street.

The main entrance for the gated WTP is West 45th Street, where a guard house is located. Once beyond this main gate there is a drive to access the WTP from the southwest corner. There is a second entrance off River Road which typically remains closed. The main gated entrance at West 45th Street controls access for the Cleveland Water Department (CWD) Treatment Plant, Great Lakes Towing, the Cleveland Public Power (CPP) substation and the Northeast Ohio Regional Sewer Department (NEORSD) Tunnel Dewatering pump station. The CWD is in the process of implementing a security project, the Morgan Access and Security

Project, to completely enclose their property to meet Federal requirements. See **Section 3.10** for additional information on the project.

Although the grass area between Crescent Avenue and Division Avenue and the grass area between West 45th Street and the main WTP building appear to be open green space, they are underground reservoirs. The western reservoir is abandoned and the eastern is active, but neither one can be disturbed. Other CWD facilities include the water intake from Lake Erie, a water main in Wendy Park, many old water mains along West 45th Street, Crescent Avenue, Division Avenue and service connections to area businesses and residences. The intake crib located in Lake Erie, which is the main intake for the Cleveland water supply, is located approximately 3 miles from the downtown Cleveland shoreline. Connected to the intake crib are two tunnels (5 and 7 foot), approximately 30-feet deep, which connect between the intake crib and the WTP. The 5-foot tunnel connects to the WTP from the west along Division Avenue and the 7-foot tunnel from the northwest.

Northeast Ohio Regional Sewer District

The 14-acre NEORSD Westerly Wastewater Treatment Plant (WWTP) is located on Lake Erie, north of the NS tracks, between the Edgewater Marina and the Port of Cleveland Bulk Terminal (Bulk Terminal). The WWTP dates back to 1922 and serves over 107,000 residents.

Cleveland Public Power Substation

Cleveland Public Power (CPP) has an electrical substation located between the Shoreway and Crescent Avenue. To the west is the Cleveland Area Soap Box Derby (Soap Box Derby) and on the eastern border is West 45th Street.

Port of Cleveland/Bulk Terminal

The Bulk Terminal is located along Lake Erie between the WWTP and Whiskey Island Marina. This facility currently utilizes shipping and rail for transport. The Bulk Terminal is not currently set-up for truck access. NS has a rail yard at the site where they store Cargill rail cars. The rail access to the Bulk Terminal is under Whiskey Island Drive. There is a set of three bridges at this crossing, known locally as the “mouse hole”. The pedestrian and Whiskey Island Drive bridges are owned by the Cleveland Metroparks and the third bridge carries NS mainline tracks. No truck access is currently provided.

The Bulk Terminal operations include stockpiling iron ore and limestone that arrive by ship from other Great Lake ports. The material is then transported by rail to customers. Logistec Corporation (Logistec) currently leases and operates the Bulk Terminal from the Port. Logistec is based in Montreal and provides specialized services to marine community and industrial companies. The business includes bulk, break-bulk and container cargo handling in approximately 30 ports and 40 terminals located in the eastern North America. In addition, Logistec offers marine transportation and cargo services geared mainly to the Arctic coastal trade, short-line rail transportation services and marine agency services.

Whiskey Island Marina/Sunset Grille/Whiskey Island Still & Eatery

The Whiskey Island Marina/Sunset Grille/Whiskey Island Still & Eatery (Whiskey Island Marina) is located on Lake Erie between the Bulk Terminal and Wendy Park. FDL Marine Services manages the Whiskey Island Marina, Sunset Grille, The Still & Eatery and Edgewater Yacht Club. The Whiskey Island Marina and restaurants typically operate between early May and mid-October.

Ivancic Marine/Channel Park Marina

The Ivancic Marine/Channel Park Marina is located on the west end of Old River. Included in the property are a marina building, winter storage and docks. Brew Boat Cleveland also operates out of this marina. The only access to the property is from Whiskey Island Drive through the NS underpass under their mainline tracks. The skewed (west to east) structure width from wall to wall is approximately 21 feet and the exact height of the structure is unknown. Although, we don’t anticipate an issue with vertical clearance.

Olde River Yacht Club

The Olde River Yacht Club (Yacht Club) is located south of the NS mainline tracks, west of Cargill located on South Whiskey Island. The Channel Park Marina shares access from Whiskey Island Drive and is located to the west. The Yacht Club includes approximately 185 dockominiums which are dock spaces that are individually owned.

Lake Erie is accessed by using Old River then the Cuyahoga River. Boats are required to go under the Willow Avenue Lift Bridge to access the Cuyahoga River. The yacht club closes at the end of October each year and reopens the following April.

Cleveland Area Soap Box Derby

The Cleveland Area Soap Box Derby (Soap Box Derby) is located between the Shoreway and Crescent Avenue. The entrance is off Herman Avenue, near the entrance to the WTP and Great Lakes Towing at West 45th Street. In conjunction with the City and CWD they were able to develop this parcel of land for the track. The pits, portable restrooms and spectator vehicles are located on the west end near the bottom of the track and the permanent starting gates are located on the east end. The slope is similar to the All-American National Track “Derby Downs” in Akron, Ohio. It is not unusual for this location to see families from 5 or 6 of the surrounding states attend events.

3.4 Traffic

See **Appendix E** for the traffic analysis.

Federal Truck Routes

The existing Federal Truck Route to access South Whiskey Island from the Shoreway begins at the West 28th Street exit where they continue south along West 28th Street, east along Detroit Avenue, north along West 25th, northeast along Main Avenue and then continue west along either Center Street or Elm Avenue. See the existing conditions map in **Appendix A**.

Truck queuing arriving and leaving South Whiskey Island has been considered. For each lift of the existing bridge, we have estimated a total queue of 4,385 feet during the peak use of the bridge. This length of queuing could accommodate a combination of approximately 41 cars, 24 box trucks and 24 semi-trucks. To determine this queue length a combination of information provided by the City and assumptions were used.

- Provided Information:
  - Truck lengths vary from 45 to 65 feet
  - Each lift takes 15 to 20 minutes
  - During the summer, up to 40 daily lifts per day
  - 180 vehicles in peak direction in the peak hour
  - 54% trucks
- Assumptions:
  - 83 (18-foot cars) + 49 (45-foot trucks) + 48 (65-foot trucks) in the peak direction during the peak hour

- 10 foot spacing between vehicles
- Lifts are evenly distributed over 12 hours.
- If you assume 40 lifts over 12 hours, then there are more than 3 lifts per hour. If each lift takes 20 minutes, the bridge is never down. Therefore, assumed this is not the case and instead assumed the bridge is lifting 50% of the time. Therefore, must get the 180 vehicles through in a half hour instead of an hour during the peak.
- Car distance including spacing is 25 feet
- Truck distance including spacing is 60 feet (box truck) or 80 feet (semi-truck)

Table 1. Truck Queue Calculation for 15 Minute Bridge Lift

Type of Vehicle	Number of Vehicles	Distance Per Vehicle (ft)	Total Distance (ft)
Car	41	25	1025
Box Truck	24	60	1440
Semi-Truck	24	80	1920
		Total	4385

Existing Traffic Volumes

Existing traffic volumes on area roadways were collected from a variety of sources in order to evaluate both existing traffic conditions and to determine how proposed alternatives would impact operations. No new traffic counts were collected for this Feasibility Study. Sources of traffic data include:

- 2010 certified traffic from the CUY-6 Lakefront West Traffic Report
- 2019 traffic counts published on ODOT's TDMS site
- 2020 Willow Lift Bridge traffic count by the City
- 2018 traffic data from NOACA's travel demand model

Upon review of the traffic volumes and discussions with the City Traffic Engineering Division, it was determined that the traffic data from actual 2019 traffic counts available from ODOT would be used to evaluate traffic conditions on the Shoreway.

In order to adjust average daily traffic (ADT) volumes to hourly volumes a factor of 0.20, obtained from ODOT's TIMS website, was applied. This resulted in a design hourly volume (DHV) that was then input to traffic capacity analysis software to determine existing and proposed conditions. The following table presents the calculated DHV for the various roadway segments that were used for analysis.

Table 2. Design Hourly Volumes

Roadway Segment	Design Hourly Volume (DHV)
EB Shoreway East of West 45th St.	4,720
WB Shoreway East of West 45th St.	4,259
EB Shoreway West of West 45th St.	3,984
WB Shoreway West of West 45th St.	3,748
Willow Avenue Lift Bridge	364 Bi-directional

Existing Shoreway Traffic Analysis

Existing conditions on the Shoreway were evaluated using the basic freeway segment module of HCS, which is appropriate for controlled access divided highways. One note is that this module only analyzes highways with a base free-flow speed of 45 mph or higher, and the Shoreway in the study area has a posted speed limit of 35 mph. This area is in transition between freeway and a surface street boulevard. The capacity results for freeway segments are based on density of vehicles measured in passenger cars per mile per lane (pc/mi/ln), and speed is not a determining factor.

Analysis of the Year 2019 DHV indicates that the Shoreway west of West 45th Street operates at LOS D in both the eastbound and westbound directions. East of West 45th Street, the Shoreway operates at LOS E in both directions. This is the existing condition in the design hour and is not impacted by the proposed South Whiskey Island access modifications. The traffic anticipated to be diverted from the Willow Lift Bridge to the Shoreway for the proposed alternatives is less than 4% of the DHV, and therefore not expected to have an impact on overall traffic conditions.

3.5 Roadway and Drainage

The Willow Avenue Lift Bridge is on the National Highway System (NHS), designated as an intermodal connector. The existing roadways are typically asphalt with a design speed of 25 mph. In general, the existing pavement along River Road, Center Street and Elm Avenue is flat, deteriorated and includes debris. The existing roadway approaches to the existing Willow Avenue Lift Bridge appear to meet minimum design criteria for 25 mph. There is a significant roadway profile slope (approximately 11%), along West 45th Street, from the Shoreway down to Division Avenue which is not ideal for large vehicles sometimes required for CWD and Great Lakes Towing. When large vehicles are required, a special request to access this area from River Road is required. There is a gate at this entrance that is not regulated with a guard house and typically remains closed.

In general, the area within the study limits drains to Old River, the Cuyahoga River and Lake Erie. The roadways are typically curbed with existing closed storm sewer systems.

3.6 Structural

Opening in 1964, the existing Willow Avenue Lift Bridge is one of the last movable bridges to be built in the City. It serves the businesses along South Whiskey Island and will soon carry the Cleveland Metroparks bike and pedestrian traffic to Wendy Park. The bridge spans Old River near the confluence with the Cuyahoga River. Its vertical span has a length of 310 feet and a total length of approximately 350 feet, with the flanking tower spans. The 310-foot length of its movable span is required to accommodate large lake-going commercial vessels that must make turning movements when approaching it from both the downstream northeast and downstream southwest sides.

The existing Willow Avenue Lift Bridge is a vertical lift bridge, climbing approximately 100 feet when the roadway is raised to allow vessels to travel underneath. With its limited vertical clearance over Old River of the Cuyahoga River when in the closed position, its movable span needs to open frequently to accommodate both commercial and recreation marine traffic that uses the waterway. The bridge is staffed 24 hours a day and 365 days a year with a full-time operator to raise and lower the structure, as required.

The ability of this structure to open and close in a reliable manner is critical since it provides the sole means of access to South Whiskey Island for both an extensive number of trucks servicing facilities on the island and those who work there. In an effort to maintain reliability, a number of rehabilitations and repairs have been performed on the bridge's structural, mechanical and electrical systems including rehabilitations performed in 1984 and 2010 and two repair projects in 2016 that consisted of replacing the ten wire ropes in each of the four quadrants for its counterweight system and replacing the outboard and inboard bearings of its northwest trunnion as an emergency task.

A design high elevation of 576 feet, for Lake Erie, was determined based on the record high elevation and a buffer of 1-2 ft for storm surges. This elevation also aligned with the FEMA elevation of 576 ft as well.

Additional information on the existing bridge is provided in **Section 7.1**.

3.7 Environmental

A Feasibility Study must consider what environmental issues may affect the alternatives considered. Several baseline studies, both desktop and in the field, were conducted of existing conditions within the study area. Alternative alignments were then overlaid on the mapping resulting from these studies to estimate the environmental impacts of each alternative. Environmental issues considered are discussed below. See **Appendix F** for documentation of the environmental studies.

Purpose and Need

Project History

The Willow Avenue Lift Bridge is a vertical lift bridge built in 1965 over the Old River and was rehabilitated in 1987 and again in 2010. The Preliminary Engineering Study Report, Volume I, completed by TranSystems for the Cleveland Metroparks on February 16, 2016 stated that during the 1987 rehabilitation the roadway deck and various other structural, mechanical and electrical components were replaced, including the air buffers and the electrical control system. During the 2010 rehabilitation, roadway and sidewalk stringers and concrete filled grid deck sidewalk were replaced. Various mechanical and electrical components were also replaced or refurbished during this rehabilitation, including replacements of the control system, brakes, and traffic gates.

The bearings on northwest sheave were replaced between January 19th and 29th, 2017 administered by ODOT, with the bridge staying in the permanent down position. The river channel was closed to large vessels during this period. Small boats had limited access and vehicular traffic remained unaffected. The bridge returned to full service with no restrictions. Load restrictions were applied on the bridge in late 2017 and currently, the wire rope replacement contract is ongoing.

Appendix F includes a letter dated September 6, 2016 by the City to the Ohio Department of Transportation (ODOT) explains that the Willow Avenue Lift Bridge is on the National Highway System (NHS) and is the only roadway access for the Cargill Salt Mine, which is an irreplaceable supplier of road salt to local municipalities, counties, and ODOT. Additionally, the bridge is the only roadway access for Ontario Stone which supplies raw materials and Sand Products which supplies 13 local foundries daily in the Northeast Region. Commercial vessels rely on lifting the bridge to gain access to provide materials to the many factories located along the Cuyahoga River.

This above-mentioned letter addressed to the ODOT also stated that on December 1, 2015, personnel investigated noises emanating from the northwest counterweight sheave of the Willow Avenue Lift Bridge. As a result of the investigation, the City was advised to cease operations of the bridge and an emergency repair was performed by City personnel on December 7, 2015 allowing the bridge to return to operation on a limited basis.

The USCG issued a notice to mariners that the bridge would only be opened once on weekdays and twice on weekends and federal holidays and would be lifted not more than four times on any given day. Subsequent investigations of the inboard and outboard bearings at the northwest operating sheave resulted in a report dated April 20, 2016 which recommended that both bearings on the northwest operating sheave and the housings be replaced. A November 14, 2016 article (https://www.cleveland19.com/story/33703079/willow-avenue-bridge-cuyahoga-river-closed/) stated the bridge was lifted during limited hours all summer causing problems for vehicular traffic, recreational boaters and freighters that haul in stone and other materials which are then trucked to customers all over Northeast Ohio. At the Olde River Yacht Club, boat owner Mark Vadaj stated that the permanent dockage went down by 30% and transient dockage from other marinas went down by 5% or more.

Hence, it can be concluded that when access or load restrictions are enforced on the Willow Lift Bridge, the economic impact is significant. Clearly there is a definite need for system linkage that would alleviate congestion. A feasible access route to the South Whiskey Island would improve mobility, mitigate environmental concerns, and enable the City to support planned community growth and development.

Purpose Statement

The purpose of this project is to explore feasible access routes onto South Whiskey Island to provide reliable access for 500 to 1,000 trucks per day, additional vehicular traffic generated by approximately five hundred employees that work on site and traffic generated on all modes of transportation by the general public. This land access must be provided while keeping the waterway clear for navigation with 100’ of vertical clearance. The only point of public access for the traffic is the Willow Avenue Lift Bridge which currently has load restrictions that cannot be removed without extensive rehabilitation. Therefore, the City needs an alternate access route to South Whiskey Island along with a long-term solution for the Willow Avenue Lift Bridge to maintain the intermodal connection and improve mobility and access in order to support planned community growth and development.

In addition to infrastructure improvements, the purpose of this project is to mitigate or improve environmental concerns such as air quality, dust, and noise. Although these are representative at residences placed near an industrial site, the project will investigate mitigation or amendment to a reasonable level to improve quality of life for residents in proximity to industry.

Need Element(s)

The Willow Avenue Vertical Lift Bridge, constructed in 1965, is at the end of its design life and requires major rehabilitation or replacement. The latest bridge inspection report provides a General Appraisal rating of 5, Sufficiency Rating of 63.9 but a Deficiency Rating of Functionally Obsolete and the bridge has been posted for load-carrying restriction. The general appraisal rating is on a scale from 1 to 9 where 9 indicates excellent condition, 4 indicates poor condition and 1 indicates imminent failure. The sufficiency rating is a general representation of the overall condition of the bridge. This rating ranges from 0 to 100 where a rating of 100 is entirely sufficient and 0 is considered deficient. Although the General Appraisal rating and Sufficiency Rating would appear to show a bridge in acceptable condition, the Deficiency Rating of Functionally Obsolete is particularly important for a Vertical Lift Bridge because its functionality depends on its ability to lift and lower when the need arises.

South Whiskey Island is home to major industries that have great impact upon the local and regional economy. There is an immediate need for a reliable access route to South Whiskey Island. The only vehicular access to the major industries on South Whiskey Island, which have a great impact upon the local and regional economy, is by the Willow Avenue Vertical Lift Bridge that carries up to 1,000 trucks per day during peak seasons. Trucks using the bridge must comply with the load restrictions as posted on the bridge. The bridge is raised on average 30 times a day to allow lake freighters, work boats and pleasure boats to travel underneath with 100’ of vertical clearance.

The Old River supports navigation by large lake freighters and is dredged to a depth of 23 feet by the U.S. Army Corps of Engineers under the Cleveland Harbor Authorization. Bridge operators are needed on site 24 hours per day, every day of the week. When the lift bridge malfunctions, which has happened repeatedly in the recent past, it can be left in the “down” position blocking vessel traffic and incurring daily fines assessed by the U.S. Coast Guard, or in the “up” position blocking road traffic.

Summary Statement

In summary, the purpose of this project is to explore feasible access routes onto South Whiskey Island to provide reliable access for 500 to 1,000 trucks per day, additional vehicular traffic generated by approximately five hundred employees that work on site and traffic generated on all modes of transportation by the general public. This land access must be provided while keeping the waterway clear for navigation with 100’ of vertical

clearance. The only point of public access for the traffic is the Willow Avenue Lift Bridge which currently has load restrictions that cannot be removed without extensive rehabilitation. Therefore, the City needs an alternate access route to South Whiskey Island along with a long-term solution for the Willow Avenue Lift Bridge to maintain the intermodal connection and improve mobility and access to support planned community growth and development.

In addition to infrastructure improvements, the purpose of this project is to mitigate or improve environmental concerns such as air quality, dust, and noise. Although these are representative at residences placed near an industrial site, the project will investigate mitigation or amendment to a reasonable level to improve quality of life for residents in proximity to industry.

Logical Termini and Independent Utility

The transportation improvement limits are defined by the need to provide reliable highway access with logical termini to important industrial assets on Whiskey Island that also accommodates lake freighters, work boats and pleasure boats to travel underneath on the Old River. The northern logical terminus is the access road to Cargill and Ontario Stone and the southern logical terminus is the Cleveland Memorial Shoreway (US20/SR6).

The proposed project is not dependent on planned transportation improvements to meet the established purpose and need. The proposed project will address existing transportation needs independent of planned roadway projects. Therefore, independent utility is established for this proposed transportation improvement.

Air Quality

The project area has been used industrially since the 1830s, when a distillery was operated on-site and resulted in the Whiskey Island name. It was joined by other industries, the railroads, and various shipping operations. In the mid-1930s, Lakeview Terrace was constructed across from Whiskey Island, one of the first federally funded public housing projects. It has been a difficult co-existence since then, and one of the most frequently voiced public concerns is about air quality. Particle pollution is emitted from nearby material stockpiles and from the exhaust of diesel-fueled commercial trucks. People who live, work or attend school near roads with high traffic volumes appear to have an increased incidence and severity of health problems associated with air pollution exposures related to roadway traffic.

Poor air quality has a negative impact upon the health and welfare of residents, workers, and visitors. The 1970 Clean Air Act (CAA) is the federal law that regulates air emissions from stationary and mobile sources and authorizes the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants.

Stationary sources of air pollution include the equipment and processes within a given property and are regulated by the EPA through a permitting program. All permit holders in the project area are in compliance with their permit requirements. Mobile sources of air pollution include all types of vehicles and mobile equipment and are subject to EPA regulations for controlling greenhouse gas (GHG) emissions, smog, soot, and other air pollution. Most of the regulations are related to diesel engines, but there are also regulations for gasoline-fueled and other spark-ignition engines.

Air quality concerns raised during this study by residents and neighbors of Lakeview Terrace were investigated and are summarized in **Appendix N** in the Recommendations to Address Public Concerns City memorandum. During design of the recommended alternative, a detailed air quality study will be performed to quantify air quality parameters, to evaluate mitigation measures, and to arrive at solutions that will alleviate exposure to harmful air toxics.

Ecological Study

A preliminary review, including fieldwork, of endangered and threatened species habitat, wetlands, and streams within the study area was conducted by AECOM personnel in August 2018. These resources were included on project mapping (see existing conditions map in **Appendix A**).

A preliminary review of wetlands and waterways identified within the study area as well as suitable bat habitat for the Indiana Bat (*Myotis sodalis*) and Northern Long-eared Bat (*Myotis septentrionalis*). These bat species are considered Federal Endangered and Federal Threatened, respectively, by the US Fish & Wildlife Service.

The study area is in the City of Cleveland, Cuyahoga County, Ohio. The coordinates of the approximate center of the study area are 41.493254°, -81.716036°. The elevation of the study area ranges from approximately 568-667 feet above mean sea level. The study area encompasses approximately 374 acres and is characterized by developed commercial lands, emergent wetlands, woodlots, and mowed lawn. The study area lies within four 12-digit Hydrologic Unit Code (HUC) areas: 041100020605 eligible; 041100010204 ineligible, 041100010204 possibly eligible, and 041100030504 eligible. The eligible/possibly eligible/ineligible designations refer to an OEPA determination that stream impacts within these watersheds are eligible or not for US Army Corps of Engineers Nationwide Permits.

Bat Habitat

A preliminary review of endangered and threatened species habitat within the study area was conducted by AECOM personnel in August 2018. The Indiana Bat (*Myotis sodalis* – Federal Endangered) and the Northern Long-eared Bat (*Myotis septentrionalis* – Federal Threatened) are considered by the US Fish & Wildlife Service to potentially inhabit every county in Ohio and thus impacts to their habitat must be considered when assessing alternatives. Suitable wooded habitat (SWH) for these species is considered as any tree covered area that is 0.5 acres or larger, containing any potential roosts (i.e., live trees and/or snags ≥3 inches diameter at breast height (dbh) that have exfoliating bark, cracks, crevices, and/or cavities) greater than 13 feet tall and at least 3 inches dbh, or any patch of trees with these characteristics that is less than ½ acre in size but is within 1,000 feet of or connected by a travel corridor to a potential maternity roost tree, ½-acre or larger stand of SWH, or any patch of wooded riparian buffer. A few areas of SWH were identified and mapped within the study area. SWH covered approximately 5.67 acres of the study area in three separate locations (see existing conditions nap in **Appendix A**). Approximately 2.08 acres of the suitable bat habitat was found to be within 100-feet of the edge of pavement. Tree species for these woodlots included Mulberry (*Morus* sp.), hickory (*Carya* sp.), eastern cottonwood (*Populus deltoides*), sugar maple (*Acer saccharum*), and black locust (*Robinia pseudoacacia*).

Wetlands and other “waters of the U.S.”

The purpose of the field survey was to assess whether wetlands and other “waters of the U.S.” exist within the approximately 374-acre study area. The Project Area was evaluated according to the procedures outlined in the USACE 1987 Wetland Delineation Manual (1987 Manual) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version2.0), and the 2015 Clean Water Rule. Following these methods, plant communities were characterized as to their soils, signs of hydrology, and dominant vegetation. Areas that exhibit hydric soils, wetland hydrology, and a dominance of hydrophytic vegetation were considered to be a wetland. At the time of this memorandum AECOM has used available knowledge and guidance from the USCAE Buffalo District. As the legal guidance from the USEPA and the USACE are developing, some conclusions in this memorandum may need to be refined.

This preliminary water resource delineation and assessment was completed in August 2018. Five wetlands were identified within the study area (see existing conditions map in **Appendix A**). All identified wetlands were preliminarily considered Category 1 (the lowest quality) due to disturbance and domination by invasive species. Estimations of the Ohio Environmental Protection Agency (Ohio EPA) Ohio Rapid Assessment Method for Wetlands v. 5.0 (ORAM) were determined based on the relative ecological quality and level of disturbance of identified wetlands. Short 2-page ORAM data forms were completed for each wetland from

the site visit. The derived wetland boundaries were approximated by hand using a Global Positioning System (GPS) receiver.

The study area was screened for the presence of areas that meet the criteria for “other waters of the U.S.” These areas consist of ephemeral, intermittent, and perennial streams, as well as open water habitats such as ponds. Beside the Old River, which traverses the center of the study area, no such “other waters of the U.S.” were found during the survey.

Wetlands 1 and 2, described immediately below, were preliminarily determined to be federally jurisdictional Waters of the U.S., due to their proximity to neighboring jurisdictional waters. A review from the USACE would be required to verify these determinations.

Wetland 1 is a palustrine emergent marsh (PEM) wetland that measures approximately 1.13 acres within the study area. The principals of the ORAM were applied in order to estimate the quality of the wetland area. Wetland 1 was preliminarily determined to be a Category One (low quality) wetland area due to its size, intensity of surrounding land uses, extensive invasive species coverage (Common reed - *Phragmites australis*), and historical disturbances.

Wetland 2 is a PEM wetland that measures approximately 0.24 acres within the study area. The principals of the ORAM were applied in order to estimate the quality of the wetland area. Wetland 1 was preliminarily determined to be a Category One wetland area due to its size, intensity of surrounding land uses, extensive invasive species coverage (Common reed), and historical disturbances.

Wetlands 3 and 4, described immediately below, were preliminarily determined to be non-federally jurisdictional Waters of the U.S., due to their construction as stormwater catchment areas. A review from the USACE would be required to verify these determinations.

Wetland 3 is a PEM wetland that measures approximately 0.15 acres within the study area. Historical aerial imagery from 2008 illustrates the construction of this wetland as a stormwater catchment area with an associated culvert inlet to convey hydrology off-site. The principals of the ORAM were applied in order to estimate the quality of the wetland area. Wetland 3 was preliminarily determined to be a Category One wetland area due to its size, intensity of surrounding land uses, extensive invasive species coverage (Narrowleaf cattail - *Typha angustifolia*), and historical disturbances.

Wetland 4 is a PEM wetland that measures approximately 0.1 acres within the study area. Historical aerial imagery from 2012 illustrates the construction of this wetland as a stormwater catchment area which receives hydrology from three culvert outlets with an associated culvert inlet to convey hydrology off-site. The principals of the ORAM were applied in order to estimate the quality of the wetland area. Wetland 4 was preliminarily determined to be a Category One wetland area due to its size, intensity of surrounding land uses, moderate invasive species coverage (Narrowleaf cattail), and historical disturbances.

Wetland 5 is a PEM wetland that measures approximately 0.12 acres within the study area. Historical aerial imagery from 2015 illustrates the construction of a fence around the wetland area. The area is highly disturbed with soil piles and excavated areas that hold hydrology. The principals of the ORAM were applied in order to estimate the quality of the wetland area. Wetland 4 was preliminarily determined to be a Category One wetland area due to its size, intensity of surrounding land uses, moderate invasive species coverage (common reed), and historical disturbances. Wetland 5 was preliminarily determined to be isolated from other federally jurisdictional Waters of the U.S. A review from the USACE would be required to verify this determination.

Streams

A preliminary review of waterways (including streams) within the study area was conducted by AECOM personnel in August 2018. The only stream within the study area is the Old River (see existing conditions map in **Appendix A**).
the Old River IS an active channel that marks the original course of the Cuyahoga River before a new, more direct opening to Lake Erie was created in 1827. All four alternatives considered in this study cross the Old River at various locations and thus have potential impacts of each crossing below the Ordinary High-water Mark (OHWM) of the Old River which must be taken into account in this Feasibility Study.

The federal channel width was confirmed at different locations along Old River on the NOAA map for Cleveland Harbor including Lower Cuyahoga River (Map Number 14839). A mark-up showing the widths can be found in **Appendix G**. The blue shaded area indicates locations where bridge abutments and/or other structural items may be located. The blue shaded area is outside the federal channel, so this area is not maintained and can be as shallow as 1 foot. The federal channel is designated as the middle white portion of Old River, inside the dashed lines. Work within the federal channel would be very difficult to get approved.

Historic Structures/Archaeological Sites

Section 106 of the National Historic Preservation Act of 1966 (NHPA), requires that any development which impacts historic properties should be identified and the adverse effects be resolved. The Ohio State Historic Preservation Office Data was accessed using the ‘Online Mapping System’ provided on the Ohio History Connection website. No historic structures were identified that impact any of the alternative routes. No historical structures and no archaeological sites such as Indian burial mounds were found in the project study area. Therefore, we conclude there are no archaeological impacts. See **Map F.1 in Appendix F** for the Ohio History Connection Online Map. The historical sites are marked by red dots.

Recreational Facilities

Wendy Park, a 22-acre unit of Cleveland Metroparks, lies along the northeaster portion of Whiskey Island (see existing conditions map in **Appendix A**). It was visited by AECOM personnel as part of the ecological study conducted in August 2018.

Regulated Materials

Whiskey Island has been studied to identify Regulated Materials of concern. An Environmental Data Resources (EDR) Report for Whiskey Island was reviewed to obtain a list of Regulated Materials and their respective locations on the site. The data obtained from the EDR report was compared with the data provided by the Ohio Office of Environmental Services Regulated Materials Review (RMR) website and the Cuyahoga County, OH - Myplaces website. Parcels with Regulated Materials concerns are shown on the existing conditions map in **Appendix A**.

Underserved Population (Noise) Impacts

Noise impacts were assumed for parcels with sensitive receptors (e.g., residences, hospitals, schools, daycare facilities, elderly housing or convalescent facilities) that lie within 400 feet on either side of each alternative centerline. Noise receptors in the study area were limited to the area bounded by River Road, Mulberry Avenue, Washington Avenue and the Shoreway (see existing conditions map in **Appendix A**). Numbers of receptors impacted by each alternative are shown in **Appendix F**.

Alternatives on new alignment can be assumed to cause noise impacts to receptors (in this case residences) in the near vicinity. A desktop aerial photograph study was conducted to assess the number of receptors parcels that lie within 400 feet on either side of each alternative centerline.

A Phase 1 Noise Analysis was completed for existing conditions within the study area. The analysis includes a noise measurement survey of the project area and traffic noise modeling. The noise analysis area consists of the residential area across Old River from South Whiskey Island, generally bounded by Center Street on the north, River Road on the west, and the Shoreway on the east and south. Predicted traffic noise levels generally ranged from the mid-30 dBA (noise level) to mid-60 dBA (noise level) mainly depending on the relative distance to the elevated Shoreway and other local roadways. According to the Typical Indoor and Outdoor Noise Levels table in **Appendix M**, the 30 dBA (noise level) corresponds to quiet urban/suburban

nighttime or theater, large conference room noise levels. The 60 dBA (noise level) corresponds to heavy traffic at 300 feet.

A future noise analysis was not completed as part of the study. A future noise analysis phase would model the traffic noise associated with future build alternatives, assess potential noise impacts from the project and evaluate potential noise mitigation elements for reasonableness and feasibility in accordance with applicable standards.

For reference, the entire noise analysis technical memorandum is included in **Appendix M**.

Underserved Population (Proximity) Impacts

The project study area consists of four Census Tracts that comprise of parcels lying within 50 feet on either side of each alternative centerline. Underserved populations include minority populations, low-income, linguistically isolated, and over age 64. It also includes Housing and Urban Development (HUD) or Section 8 Housing such as the CMHA housing bounded by River Road, Mulberry Avenue, Washington Avenue and the Shoreway (see existing conditions map in **Appendix A**).

Alternatives on new alignment can also be assumed to cause proximity impacts to underserved population residences in the near vicinity. A desktop aerial photograph study was conducted to assess the number of receptors parcels that lie within 150 feet on either side of each alternative centerline. Numbers of CMHA buildings and their residents impacted by each alternative are shown in **Appendix F**.

3.8 Geotechnical

Anticipated Subsurface Conditions in the Project Area

While no project-specific geotechnical investigations have been performed at the time of this study, AECOM has previously implemented a number of geotechnical investigations in the general area of the project, including:

- Numerous borings at the Garrett Morgan Water Treatment Plant and surroundings (20+ borings up to 100+ ft depth);
- Borings within the Port of Cleveland Bulk Terminal rail loop area (8 borings, up to 100+ ft depth performed in early 2000s);
- Borings at Edgewater Park Marina to the west of the project (6 borings up to 50 ft depth);
- Borings at the Port of Cleveland Dock 22 to the east of the project (20+ borings, up to 140 ft+ in depth).

AECOM also has access to historical boring data from the original construction of the Willow Avenue Lift Bridge.

Based on this information, the anticipated subsurface profile within the project limits includes, from highest to lowest elevation:

- Granular Deposits – These deposits form the slope and higher ground of the valley wall along the southern limits of the project area in the vicinity of West 45th Street and east, along the Shoreway. They consist primarily of medium dense to dense sands to sandy silts and are likely to be a combination of fill materials (closer to the ground surface) and natural beach deposits.
- Fill soils – Manmade materials consisting of primarily granular (sands and silts) materials. The fills are expected to be heterogenous in both composition and consistency and are likely to be in a loose to medium dense condition. In the area of the Bulk Terminal and east, fills may also consist of slag, cinders, or other manmade materials.
- Alluvial Deposits – These are soils placed by river deposition and consist of primarily sand soils. Organic materials (peats and organic clays) are also typically present, above or interbedded with the sand. The alluvial deposits are anticipated to be in a loose or soft condition.
- Lacustrine Deposits – These are glacial lake deposits consisting of low to medium plasticity lean clays. These deposits are soft to medium stiff at higher elevations and become increasingly stiffer in consistency with depth.
- Till Deposits – Glacial tills consisting of unsorted sand and clay mixtures and with very stiff to hard consistency.
- Shale Bedrock – Chagrin Shale underlies the project area and is a soft shale with siltstone interbeds. Competent Chagrin Shale in the area typically has unconfined compressive strength in the 2-4,000 psi range. A weathered zone on the order of 5 to 10 ft in thickness is typically encountered below the soil-rock interface, with competent material below.
- Based on the available information, the elevation ranges in which these various strata are encountered vary across the project area. Generally, bedrock is anticipated to slope from west to east across the site, from around El. 500 at the west to around El. 420 at the Cuyahoga River. The overlying till deposit is relatively thin at the western end of the site (on the order of 10 ft thickness) and thickens moving east toward the River – the till is more than 50 ft thick at the location of the existing Willow Avenue bridge. **Table 3** provides the approximate elevation ranges over which these stratigraphic units were encountered in the available borings and the average depth of the top of the stratum (where available), grouped by location across the project area.

Table 3. Stratum Elevation Range and Average Top Elevation of Stratum

Stratum	West 45th Street East to Morgan WTP Property Limits	Bulk Terminal Area	Willow Avenue Lift Bridge
	Stratum Elevation Range and Average Top Elevation of Stratum (ft)		
Granular Deposits	Generally Above El. 584	-	-
Fill	584+ to 565 (Avg. Top El. 583)	578+ to 555	583 to 575 (Avg. Top El. 583)
Alluvium	575 to 551 (Avg. Top El. 571)	558 to 545	581 to 532 (Avg. Top El. 577)
Lacustrine	575 to 500 (Avg. Top El. 559)	547 to 493	550 to 485 (Avg. Top El. 541)
Till	508 to 493 (Avg. Top El. 505)	495 to 474	510 to 417 (Avg. Top El. 502)
Top of Shale Bedrock	498 to 493 (Avg. Top El. 495)	484 to 474	427 to 417 (Avg. Top El. 422)

See **Appendix H** for the historic borings map.

3.9 Utilities

Utility coordination was completed as part of the study. See **Appendix I** for the utility coordination information.

In general, the existing utilities within the project study limits are as follows:

Whiskey Island Drive

- Overhead electric transmission lines along north side of Whiskey Island Drive from the WWTP to Wendy Park with several crossing Whiskey Island Drive
- Water and sanitary sewer lines under the roadway

West 45th Street

- CPP substation located on west side of the roadway, near the Shoreway interchange
- 12kV electric distribution lines under the roadway
- 138kV electric transmission lines under the roadway
- Underground electric along the east side of roadway
- Sanitary sewer along the middle of the roadway
- Gas line along the west side of the roadway
- Multiple water lines under the roadway

Crescent Avenue

- Overhead electric lines along both sides of roadway
- Underground electric along center of the roadway
- Multiple water lines along both sides of the roadway
- Sanitary sewer along the north side and a portion of the south side of the roadway

Division Avenue (East End to West 45th Street)

- Overhead electric lines along both sides of the roadway
- Two water lines under the roadway. One of these is the deep intake which connect between the crib in Lake Erie and the WTP.
- Gas line along the north side of the roadway

WTP

- Complex network of underground water lines, varying in size
- Overhead and underground electric lines along Division Avenue and between buildings
- Gas and sanitary sewer lines under the north side of Division Avenue
- Connected to the intake crib are two tunnels, approximately 30-feet deep, which connect between the intake crib and the WTP. The 5-foot tunnel connects to the WTP from the west along Division Avenue and the 7-foot tunnel from the northwest.

River Road

- Two sanitary sewers and one water line under the roadway
- Gas line along northwest side of the roadway
- Overhead electric lines along both sides of the roadway

Elm Avenue

- Two sanitary sewers and one water line run under the roadway
- Gas line along northeast side of the roadway
- Overhead electric lines along the northeast side of the roadway and crosses the roadway several times

Willow Avenue Lift Bridge

- Gas and electric lines cross the Old River in line with the bridge

South Whiskey Island

- Several overhead electric lines along each of the properties. Most of the electric lines appear to be connected to light poles.
- Gas line under the main drive to Cargill

3.10 Future Site Conditions

The projects described in this section are current or future improvements which are designed and have a set construction schedule. Any information on these projects provided by the stakeholders is included in our basemapping.

Cleveland Water Department Security

The current main entrance for the gated WTP is West 45th Street, where a guard house is located. Once beyond this main gate, there is also a drive to access the WTP from the southwest corner. There is a second entrance off River Road which typically remains closed.

The CWD is in the process of implementing a security project, the Morgan Access and Security Project, to completely enclose their campus. The intention is for Great Lakes Towing, CPP and NEORSD to access their facilities without entering the WTP gated campus. The existing guard house off the West 45th Street exit will be relocated to Division Avenue. A gate will be added to the drive across from the current guard house and across West 45th Street north of Crescent Avenue. A new roadway, West 50th Street, will be built to provide a new connection between Crescent Avenue and Division Avenue. The location is east of West 53rd Street near the existing gravel parking lot. The new route has been designed for larger trucks and is within public R/W. Two new drives for access to Great Lakes Towing off Division Avenue will also be added. A new fence will be placed, as required, to completely close the campus.

A new sign is also intended to be part of the project. The CWD provided a couple of locations they were investigating. It is our understanding the intention is to place the new sign on the west side of West 45th Street, just north of the Shoreway, prior to the road which connects to the Herman Avenue bridge.

The information on this project provided by the CWD is included in the basemapping and is included on the figures.

Cleveland Metroparks

Cleveland Metroparks has received a federal TIGER grant to help fund the recommended projects from the Re-Connecting Cleveland Pathways to Opportunity Study to construct five trail projects to fill in critical gaps in the active transportation network in the City.

One of the projects includes the Wendy Park Bridge over NS beginning at the northern limit of the Willow Avenue Lift Bridge. The Wendy Park Bridge will link the Centennial Trail Lake Link to Wendy Park on Whiskey Island and Lake Erie. The bridge and remaining section of the Centennial Trail Lake Link provide the final

connection to access the lakefront from the Flats. The Centennial Trail Lake Link currently ends at the northeast corner of Mulberry Avenue and River Road. The last link planned to connect the trail to Wendy Park is from this point, north along River Road, across the Willow Avenue Lift Bridge to the new Wendy Park Bridge. Construction of the Wendy Park pedestrian bridge (PID 104804) and final section of the Centennial Trail Lake Link are planned to be completed in 2021.

The Whiskey Island Connector trail will link the new Wendy Park Bridge to Edgewater Park and the Cleveland Lakefront Bikeway. The connector is an off-road shared use paved trail which parallels Whiskey Island Drive. A new timber bridge is required to carry the trail along NS property near the entrance to Ivancic Marine/Channel Park Marina and the Yacht Club. Construction is anticipated to be completed in 2021.

The Metroparks provided the layout of the Wendy Park Bridge, Centennial Trail Lake Link and Whiskey Island Connector. The layouts are included in our basemapping as shown on the existing conditions map in **Appendix A**.

Northeast Ohio Regional Sewer District

NEORSD is in the process of constructing Westerly Combined Sewer Overflow Improvements. Some of these improvements are within this study area.

The first improvement is part of the Westerly Low-Level Relief Sewer project. As part of this project, a new lift station was constructed at the southwest corner of the existing Willow Avenue Lift Bridge. The 72-inch storm sewers, which connect to the lift station, run along River Road and Elm Avenue. The storm sewers are approximately 20 feet deep near the existing bridge. The depth at the south end of River Road is approximately 28 feet and at the intersection of Elm Avenue and Spruce Avenue is approximately 15 feet.

The second improvement is the Westerly Tunnel Dewatering Pump Station (pump station) project. The new pump station is being constructed at the western end of the Soap Box Derby. The Westerly Storage Tunnel connects to the east side of the pump station. The site includes underground and above ground improvements. The pump station building stands approximately 35 feet high. The drive to access this site extends off Crescent Avenue.

3.11 Other Proposed Improvements

The improvements included in this section are intended to be completed in the future, within the study limits, but are not completely designed and/or do not have a construction schedule set.

Great Lakes Towing Expansion

Great Lakes Towing has intentions to expand their facilities further west in the future. Their goal is to have the ability for large vessels to access Old River all the way at the west end. They are currently working with the City to obtain easements to gain additional access to expand.

Old River is known to currently be dredged to the west end of Cargill's property but Great Lakes Towing hopes to dredge further west so they could fully access their expanded property. They would like to be able to utilize the former graving dock area. This section of Old River is at the west end, south of the Ivancic Marine/Channel Park Marina storage building. Their current plan is to build a new office building at this west end of the property. Great Lakes Towing shared preliminary concepts during our discussions but did not provide details on the work or schedule anticipated.

Filling of Old River

It is our understanding that the United States Environmental Protection Agency (USEPA) intends to fill in Old River at the former graving dock location. This section of Old River is at the west end, south of the Ivancic Marine/Channel Park Marina storage building. This information was provided multiple times throughout the study, but the details of this work or when the work may be completed is unclear. Background information on the Old River is included in **Section 3.7**.

4. Stakeholder Coordination

The stakeholder involvement process began by identifying stakeholders with whom which we would make contact. Obviously as the sponsor of this study, the City is a key stakeholder. AECOM worked closely with the City Engineering and Construction staff throughout the study. For all other stakeholders, we initially touched base for data gathering to understand each of their concerns, upcoming projects, etc. to establish their parameters. Based on these conversations the AECOM team placed their parameters in order of importance from the stakeholder's viewpoint. The information gathered was used to establish criteria for the alternative evaluation process.

Next, AECOM followed up with stakeholders as requested or as required to further discuss the development of the alternatives.

Then, AECOM continued to work through the alternatives so they could be presented at the one public meeting (open house format) to get public input. The input was incorporated in the alternative evaluation analysis. None of the details of the parameters and their weights used in the analysis were presented at the public meeting.

All these meetings were logged in an excel spreadsheet. See **Appendix J** for the contact list and the stakeholder meeting summaries.

4.1 Major Industrial Businesses

Cargill Deicing Technology

City and AECOM team personnel met with Cargill on July 30, 2018. The main concerns expressed by Cargill were access to their site for the ship/rail/truck/supply distribution and reliably to maintain current operations. Due to the unreliability of the existing Willow Avenue Lift Bridge, Cargill and the Yacht Club came to an agreement to add a temporary path between the northwest corner of Cargill and east end of the Yacht Club. Cargill is permitted to park a vehicle on the marina side of the gate to be used in the case of an emergency. This access allows Cargill workers a way to leave Whiskey Island if the Willow Avenue Lift Bridge is not operational. While performing the MCDA analysis, AECOM followed up with Cargill to confirm our understanding of how each alternative could affect their operations and efficiency in the final condition whether positive or negative. On February 19, 2020 feedback was provided and this information was incorporated into the analysis.

Ontario Stone Corporation

AECOM team personnel met with Ontario on September 18, 2018. Ontario has an interest in expanding but dock space is very limited. The main concerns expressed by Ontario were access to their site for their ship/truck distribution and reliably to maintain current operations. Ontario stockpiles 75% of their material on the south property and the other 25% on the north property. Both locations are required to prevent cross contamination of the 35 different materials they distribute. While performing the MCDA analysis, AECOM followed up with Ontario (February 14, 2020) to confirm our understanding of how each alternative could affect their operations and efficiency in the final condition whether positive or negative. On February 17, 2020 Ontario provided feedback by email and this information was incorporated into the analysis.

Canadian Silica Industries Inc.

AECOM team personnel met with Csi on September 27, 2018. The main concerns expressed by Csi were access to their site for vessels and trucks plus the availability of additional land for expansion. When the bridge is down for maintenance it is typically set in the up position which has caused significant delays in allowing trucks to cross the bridge. The unreliability of the bridge affects their vessels (10-17 per year), truck traffic (15-20 trucks per day in peak season) and holds them back from expanding. The reliability of the Willow Avenue Lift Bridge is also a concern and inconvenience to the employees. Employees have been stuck for numerous hours after a shift change on a Friday night. They rely on the bridge to stay in business. Erosion along the Old River has reduced their useable footprint even further. While performing the MCDA analysis, AECOM followed up with Csi to confirm our understanding of how each alternative could affect their operations and efficiency in the final condition whether positive or negative. On February 18, 2020 feedback was provided and this information was incorporated into the analysis.

4.2 Norfolk Southern Railroad

City and AECOM team personnel met with NS on September 4, 2018, for a second time on September 20, 2018 and finally on October 3, 2018. There was additional coordination to obtain a preliminary engineering agreement between the City and NS and to discuss the two submittals made to NS. The City and AECOM made submittals to NS on October 10, 2018 and June 27, 2019 for their review and approval of current alternatives.

The main concern expressed by NS is disruption in their mainline tracks. They do not want permanent at-grade crossings but are open to temporary at-grade crossings which would require a formal approval. NS is also planning for future widening of the mainline tracks through this study area. The current bridge crossing over the Bulk Terminal (known locally as the "mouse hole") does not currently accommodate the additional tracks but widening of the bridge could become part of the track widening project.

Their main concerns expressed, related to the Bulk Terminal, would be the disruption of NS access to the Bulk Terminal caused by congestion due to truck access and by adding trucks to the Bulk Terminal would introduce an opportunity for competition. The current loop track at the Bulk Terminal is performing well. The train cars back-up to provide relief along the current loop.

4.3 Adjacent Land Owners

Cleveland Metroparks

AECOM team personnel met with the Metroparks on September 18, 2018 and December 3, 2018. The main concerns expressed by the Metroparks are their need for a direct connection to Wendy Park, protecting their investments, quality of life, keeping truck traffic away from Wendy Park and people utilizing their facilities, damage to the recently built roundabout at Edgewater Park, land adherence to previously completed master plans and a holistic approach to serving trucks, pedestrians, cyclists, vessels, etc.. They do not find it acceptable to go around a different route. To meet this need, they are open to the idea of the existing Willow Avenue Lift Bridge remaining in place and locked in the up position. They feel elevators could be installed to access the raised bridge deck for trail users. The Metroparks would like to see air quality, dust, noise and general pollution considered.

Cuyahoga Metropolitan Housing Authority

AECOM team personnel met with CMHA on October 31, 2018 and August 1, 2019. The team then met with the residents of Lakeview Terrace and Lakeview Tower on September 4, 2019. AECOM did not receive formal comments from the meeting with the residents. The main concerns expressed by CMHA and the residents are safety for pedestrians (including wheelchairs), truck traffic, connectivity/access to other areas and walkability. Pedestrian safety is already a concern, so if additional truck traffic were added in the neighborhood, this would become an even greater concern. Truck traffic causes not only safety concerns but also causes deterioration of the roads. Increased truck traffic could also reduce existing on-street parking. The residents currently feel isolated from the neighborhoods and community assets such as Wendy Park. There is development happening in the surrounding neighborhoods and the residents feel there is very little

information being shared providing updates to them. CMHA would also be pleased to see this study integrated into one larger master plan.

The Great Lakes Towing Company

City and AECOM team personnel met with Great Lakes Towing on August 23, 2018. AECOM team personnel met again with Great Lakes Towing on December 3, 2018. Main concerns expressed during our initial meeting with Great Lakes Towing are maximizing all usable space for current and future expansion with new parcels, maintaining truck and reliable Old River access, docking tug boats at Whiskey Island, and the ability for large vessels to be able to access Old River all the way to the west end of the old graving dock where their new facilities will extend. It is their understanding that Old River is currently dredged to the end of Cargill. This limit aligns with the information provided by the USCG. The former graving dock is to be filled in by the EPA. See **Section 3.11** for additional information on this work. Great Lakes Towing is planning an expansion on their site because they want to take advantage of any available space for their operations. See **Section 3.11** for additional information.

The follow-up meeting with Great Lakes towing was to discuss the current draft alternatives affecting their facility. Note, these alternatives were in draft form and were still under NS review. Main concerns expressed during the follow-up meeting were about the location of the West 45th Street Fixed Bridge as it relates to their property and office building. They also expressed concerns about how the alternatives would affect their plans for expansion on the new parcels they are obtaining from the City.

The Cleveland Water Department

City and AECOM team personnel met with CWD on July 30, 2018 and June 19, 2019. The significant slope (approximately 11%), along West 45th Street, from the Shoreway down to Division Avenue is not ideal for large vehicles sometimes required for CWD and Great Lakes Towing. When large vehicles are required, a special request to access this area from River Road is required. There is a gate at this entrance that is not regulated with a guard house.

The main concerns expressed by CWD is protecting the reservoirs and their closed secure campus, impacts to existing facilities, their upcoming Morgan Access and Security Project and receiving approval from the City for their new sign location.

Northeast Ohio Regional Sewer District

While there was no formal meeting with NEORSD, they were included in the project kick-off meeting and received meeting notes to all 27 bi-weekly progress meetings between the City and AECOM during the study.

Cleveland Public Power/Substation

While there was no formal meeting with CPP, they were included in the project kick-off meeting and received meeting notes to all 27 bi-weekly progress meetings between the City and AECOM during the study. AECOM also coordinated separately to understand their existing facilities, how they may be affected by the alternatives and cost associated with potential relocations.

The Port of Cleveland/Bulk Terminal

AECOM team personnel met with the Port of Cleveland (Port) on August 28, 2018 to discuss the Bulk Terminal. The main priorities expressed were to establish truck access, advocate for the Cleveland Metroparks trail connection and advocate for all maritime activity. Their maritime interests include supporting the continued operation of mainly commercial and industrial developments.

Whiskey Island Marina/Sunset Grille/Whiskey Island Still & Eatery

The AECOM team met with the Whiskey Island Marina on October 22, 2018. The main concern expressed was the lack of access. A second access would be ideal because the current access is from the Cleveland Metroparks Roundabout at West 73rd Street. The roundabout is highly utilized for access to Edgewater Park. During special events at Edgewater Park, it can be difficult to access the Whiskey Island Marina. At times, traffic backs up to the Shoreway. The Shoreway is also closed sometimes for special events, which makes access to the Whiskey Island Marina impossible.

Ivancic Marine/Channel Park Marina

AECOM team personnel met with Ivancic Marine, also owners of Channel Park Marina, on August 7, 2018 to discuss the study. The main concerns expressed were the reliability of the Willow Avenue Lift Bridge and difficult vehicle access during peak times. There have been times when the bridge is held in the down position for maintenance so the boats from their yacht club could not pass under the bridge.

Olde River Yacht Club

AECOM team personnel met with the yacht club on October 12, 2018. The main concerns expressed were the reliability of the Willow Avenue Lift Bridge and difficult vehicle access during peak times. There have been times when the bridge is held in the down position for maintenance so the boats from their yacht club could not pass under the bridge. There have also been times when the bridge is locked in the up position. For this situation, the yacht club built a pathway to Cargill so their employees could enter and exist South Whiskey Island.

Cleveland Area Soap Box Derby

While there was no formal meeting with the Soap Box, the City provided information to understand their facility.

4.4 Additional Stakeholders

The Ohio Environmental Protection Agency

AECOM team personnel had a phone discussion with the Ohio Environmental Protection Agency (OEPA) on August 24, 2018 regarding the filling of Old River. As discussed in **Section 3.11**, it is our understanding the intention is to fill in Old River, at the west end, south of the Channel Park Marina storage buildings. Our intention was to discuss the study in general and find out if they have any information on the planned fill. The USEPA is the lead with minimal OEPA involvement so they didn't have details to offer. If our alternatives were to require additional filling, the city would be required to apply for a separate permit. If the work were greater than 0.5 acres, then an individual permit would be required. The individual permit can be costly and take upwards of a year to receive. If the work is less than 0.5 acres, a nationwide permit may be an option.

United States Coast Guard

AECOM team personnel met with the USCG initially on August 28, 2018 again on November 28, 2018 and a third time on December 13, 2019. The initial meeting was to discuss their requirements, mission, and permit process. The USCG primary goal is to meet reasonable needs of navigation. They are interested in reliability of a movable bridge or no bridge over Old River. Any new crossing would require a USCG permit. We are to use a 100-foot vertical clearance as a guide for a new structure crossing Old River. There is no set vertical clearance requirement, so the final decision on vertical clearance would be up their discretion. A secondary way to access South Whiskey Island, even if the bridge were replaced, is of interest to USCG. The follow-up meeting was to discuss specifics on the width of the Old River federal channel as described in **Section 3.7**.

The third meeting was to provide the USCG with an update on how the alternatives have progressed since the last meeting and discuss any concerns or questions. If the existing Willow Avenue Lift Bridge were to be rehabilitated, a temporary single leaf bascule bridge is an option to maintain access to South Whiskey Island. While not common on the Great Lakes, the USCG is agreeable to the use of this type of temporary bridge. Additional information on the rehabilitation discussion is in **Section 7.1**. The idea of a new movable bridge at Mulberry Avenue was discussed previously, so AECOM followed all requirements provided by the USCG. As stated in an email response received from the USCG on February 18, 2020, USCG is agreeable to this alternative and the others identified to be further evaluated with MCDA. Additional information on the new movable bridge discussion is in **Section 7.3**.

Cuyahoga County

AECOM team personnel had a phone discussion with the Cuyahoga County Bridge Department (County) on September 4, 2018. This call was to discuss whether the County owned any infrastructure within the study area. The pedestrian bridge over the Bulk Terminal was initially owned by the County but has since been turned over to the Cleveland Metroparks. The County placard is shown on the bridge, but the County no longer owns this or any other assets within the study area.

Lake Carriers' Association

AECOM team personnel met with the Lake Carriers' Association (Lake Carriers) to discuss their operations and potential concerns. Their primary goal is to represent ships that travel the Great Lakes and mostly deal with ships along the Cuyahoga River. The main concern expressed was the reliability of the Willow Avenue Lift Bridge over the Old River.

Northeast Ohio Areawide Coordinating Agency & Ohio Department of Transportation

AECOM team personnel had a phone discussion with NOACA and ODOT on September 21, 2018. This call was to provide ODOT and NOACA background on the project and discuss access off the Shoreway and the Federal truck routes. In the late 1960's, the Shoreway was established as a truck route, and at the same time the westbound truck traffic prohibition started. The Shoreway is probably not a limited access (LA) ROW and functional classification was changed to an arterial. During planning of the Shoreway project in 2007, a signalized intersection would have likely degraded the Level of Service too much on the state route. An evaluation of the capacity of a signalized intersection would need investigated but suspect it may fail in peak hours. Could be argued it works all other times and access benefits (among other benefits) are worth it. Perspectives have changed over the last 10 years.

4.5 Public Meeting

On November 12, 2019 a public meeting took place to provide an opportunity to understand and gain public feedback on any and all the remaining alternatives. Our main objective was to listen to the public. We were particularly interested in receiving viewpoints on benefits or advantages that an alternative may offer.

The meeting included a PowerPoint presentation and large display boards around the room for discussion following the presentation. All public meeting materials are provided in **Appendix K**.

The three main public concerns mentioned at the meeting were trucks thru the neighborhood, air quality and bike connectivity. Public input was incorporated into the MCDA in the development of the preferred alternative.

Appendix K includes the following:

- public meeting invite
- fact sheet
- sign-in sheets
- PowerPoint presentation
- summary of public meeting conversations and the written comments obtained at the meeting
- news articles related to the public meeting

4.6 Stakeholder & Public Update

Following the public meeting, the feasibility study progressed and the need for a more refined traffic analysis was identified to confirm alternatives would meet federal funding criteria for traffic performance. New relevant traffic count information became available so the traffic analysis for the New Fixed Bridge at West 45th Street Alternative was completed. The analysis showed that the needed proposed traffic signal would increase traffic congestion on the Shoreway and result in the lowest Level of Service (LOS) of F, making it ineligible for state or federal funding. Since the funding of a $60 to $100 million dollar project by City and local resources alone is not feasible, the New Fixed Bridge at West 45th Street alternative was removed from consideration. A fact sheet was released to the stakeholders and public on June 19, 2020. As a result, many comments were received, and a news article released. To address these public concerns, on March 15, 2021, the City created and distributed a memorandum with recommendations to address these concerns.

Appendix N include the following:

- fact sheet
- news article
- public comments
- stakeholder comments
- City of Cleveland memorandum

4.7 Other Coordination

Division of Air Quality

The Division of Air Quality is a division within the City's Department of Public Health. AECOM team personnel had a phone call with the Division of Air Quality on July 25, 2019 to discuss the project because air quality is a known issue within the study area. It is not anticipated that this project will make a positive or negative impact on air quality but wanted to investigate further. This division can provide information for existing monitoring stations. Each site has different levels and/or types of monitoring. There is a total of 16 throughout Cuyahoga County but the one closet to our study limits is "Fire Station No. 4" which is located at 3136 Lorain Avenue in Cleveland, Ohio. This location is far from our study area but the best information available with existing monitors. The monitors provide information on the total suspended particulate (TSP) and lead.

There is a known previous issue with Ontario Stone trucks tracking dust on the roads, which would become airborne. Fire Station No. 4 would likely not pick this up. It is possible there were previous complaints about dust from the stockpiles blowing over Old River. An investigation with the enforcement division is required to obtain this information. All the businesses on South Whiskey Island have air permits for their emissions.

The following website offers a way to obtain data for the existing monitoring sites.

https://aqs.epa.gov/aqsweb/airdata/download_files.html

The information below is used to obtain the information for the Fire Station No. 4 monitoring site:

- Site Name – Cleveland Fire St4
- Site Number – 390350042
- Address – 3136 Lorain Avenue, Cleveland, Ohio, 44113

Information below was gathered for the Fire Station No. 4:

- State Code: 39
- County Code: 35
- Station “Fire 4”: 42
- Other close station: 60
- Row 11823 on the spreadsheet gives the data for this site
- Column AB lists the Arithmetic mean = 30.2 micrograms per meter cubed
- Runs every 6 days. Runs per the EPA calendar.
- Highest reading in 2019 is 65 micrograms per meter cubed
- PM10 – measures course particulate - nearest site right next to the USPS building – Orange Ave/Broadway Ave. For PM10: 150 micrograms per meter cubed is the national air quality safe level (PM10 monitoring site: Code 39-035-0060)
- PM25 - measures fine particulate
- 30.2 value → no national air quality standard for this → but is pretty low.
- TSP is not a criteria pollutant

There is no associated quality level or national standard for the particulate matter shown above. The only real way to monitor if there is an air quality issue at our site would be to set-up a mobile monitoring station. There is a robust network of all the Ohio counties, but site-specific information is not available. Air quality is reviewed from a regional perspective in accordance with federal air quality standards.

5. Multi-Criteria Decision Analysis Framework (MCDA)

In lieu of a decision matrix spreadsheet, the AECOM team utilized the Multi-Criteria Decision Analysis (MCDA) tool for this study and development of the preferred alternative. MCDA is a methodology within the field of Operations Research. MCDA synthesizes information of a complex and conflicting nature by taking explicit account of multiple criteria, some of which may be intangible.

For an alternative to be fully considered with the MCDA, it first must meet the Purpose and Need (**Section 3.7**). Additionally, the alternative must have a feasible method to maintain access to South Whiskey Island while constructing the alternative. Any alternative which impacted the Coast Guard Station or did not provide bike and pedestrian access were also not included. Lastly, the alternative needed to receive support from NS to move forward with consideration. If an alternative did not meet all these criteria, that alternative could not be considered any further. These measures are not included in the MCDA analysis. Maritime access will be maintained for all alternatives.

Preliminary NS approval is necessary during the feasibility study phase because without their support the project could be at risk for significant schedule delays and design rework in the future. If the preferred alternative were to impact NS property in any way, they have the right to not accept the design.

The AECOM team evaluated four alternatives to provide access to South Whiskey Island using a Multi-Criteria Decision Analysis approach. This approach involved identifying an overarching project goal – to find the Best Long-Term Alternative to the Willow Avenue Lift Bridge - and the sub-goals, or criteria, on which each alternative was evaluated. Each criterion is composed of one or more measures. The team confirmed that the collection of measures encompassed all aspects relevant to the evaluation (comprehensiveness) and that measures did not overlap (avoiding double counting). As seen in the section Model Structure, a hierarchy of goals helped organize the decision model, and various units of measurement – some qualitative and some quantitative - were used to rate the performance of each alternative on each of the measures. **Table D.2 (Appendix D)** includes this data. To maintain an unbiased viewpoint in the study, the AECOM team completed the framework prior to identifying the four alternatives evaluated.

The eleven (11) criteria and seventeen (17) measures evaluated include the following:

1) **Accessibility During Construction**
   a) *Access to South Whiskey Island* - Complexity to maintain access during construction for all modes of transportation (vehicular, maritime, bike, pedestrian, and rail).
2) **Cost, Total**
   a) *Project Cost* - Includes Construction, Preliminary Engineering, Construction Engineering, Right of Way Acquisition, Utility Relocation, and inflation (assuming construction in 2024).
   b) *Long Term Operation & Maintenance Cost* - Present Value assumed 3% inflation and the number of years correspond with the design life. The Future Values for operations and maintenance are assumed to be $300,000 per year for Alternatives 4, 15, and 16 and $30,000 for Alternative 36.
3) **Design Considerations**
   a) *Aesthetics* – Opportunity for aesthetic enhancement.
   b) *Bridge Design* – Complexity of the bridge design.
   c) *Geotechnical Design* – Complexity of the geotechnical design.
   d) *Roadway Geometry* - Deviations from current City and ODOT roadway design criteria such as steep grades, sharp curves, etc.
   e) *Site Security* – Complexity to provide site security which includes Maritime Security (MARSEC); gates and fencing per US Coast Guard and Department of Homeland Security; and cameras and monitoring at moveable bridge gatehouses.
4) **Environmental Impact**
   a) *Air Quality* – Change in air quality resulting from the alternative. Air quality in the vicinity of the project is a known critical issue and will be further evaluated in the final design stage of the project design process. The impact to air quality was the same for each alternative evaluated therefore, this measure did not impact the ranking of the alternatives.
   b) *Ecological Resources* – Impacts to ecological resources such as bat habitats, streams, and wetlands. The impacts to these resources were the same for each alternative evaluated therefore, these measures did not impact the ranking of the alternatives.
   c) *Environmental Justice* – Number of residents, classified as part of underserved populations within 150 feet, impacted by the proposed alternative.
   d) *Historic and Architectural Resources* – Impacts to the Coast Guard Station. Deemed non-negotiable so this was treated as a prescreening criterion for the proposed alternative.
   e) *Noise* – Number of sensitive receptors (residents), within 400 feet, impacted by the proposed alternative.
   f) *Regulated materials* – Number of parcels impacted by regulated material issues such asbestos, lead, brownfields, etc.
   g) *Recreational facilities* – Acres of Wendy Park impacted by the proposed alternative. The impacts to Wendy Park (no impacts) were the same for each alternative evaluated therefore, this measure did not affect the ranking of the alternatives.
5) **Implementation Schedule**
   a) *Improvement Implementation* – Complexity to implement the proposed alternative such as permitting, right-of-way acquisition and construction. These tasks can have schedule implications.
6) **Life Expectancy of Alternative**
   a) *Design Service Life* – The average usable life of the proposed alternative.
7) **Major Area Industrial Businesses Impact**
   a) *Operations and Efficiency* – Efficiency of post construction operations at the major industrial businesses Cargill, Ontario Stone and CSI (formerly known as Sand Products).
8) **Multi Modal Transportation Access –** Once an alternative is in place, this is the degree to which it provides access in and around South Whiskey Island for vehicles, pedestrians, bikes, rail and maritime.
   a) *Bike and Pedestrian* – Deemed non-negotiable so this was treated as a prescreening criterion for the proposed alternative.
   b) *Rail* – Impact to rail access due to the proposed alternative. The impact to rail access was the same for each alternative evaluated therefore, this measure did not impact the ranking of the alternatives.
   c) *Vehicular and Maritime* – Potential vehicular and maritime delay for any stakeholder.
9) **Railroad Impact**
   a) *Acceptance by Norfolk Southern* – Deemed non-negotiable so this criterion was treated as a prescreening criterion for the proposed alternative.

10) **Safety** –

   a) *Conflict Points, Truck Traffic* – Changes to movement and conflict points from current conditions. Movement changes include items such as trucks through neighborhoods, including Lakeview Terrace and the mixed-use area to the northeast (Mulberry Avenue, Center Street and Elm Avenue from the Shoreway to River Road), where there are businesses/pedestrians and a possibility of residences being added in the future. Includes all modes of transportation.

11) **Stakeholder Considerations**

   a) *Economic Development* – Opportunities for economic development within the neighborhoods defined as the Detroit Shoreway, Ohio City, Lakeview Terrace, and the mixed-use area to the northeast (Mulberry Avenue, Center Street and Elm Avenue from the Shoreway to River Road).

The evaluation measures were normalized to a common scale – utility, which is a measure of desirability – in order to develop a score for each alternative. Utility varies from 0 (least desirable) to 1 (most desirable). The score of each alternative on the overall goal is a weighted sum of its utility on each measure. The Elicitation of Values and Preferences, included in **Section 8.1**, details how Utility Functions – the functions that relate each scale to the common measure – and Weights were developed.

The results, shown in **Section 8.2**, include the ranking of the four alternatives, the overall utility for each, and their score on each criterion.

Model Structure

MCDA Consulting and AECOM identified eleven (11) criteria with which to evaluate project alternatives in order to identify the best Long-Term Solution for the Willow Avenue Lift Bridge. These appear on the first column of **Table D.1 (Appendix D)**. One or more measures were selected to quantify each criterion (column 2). Measuring scales, numerical or qualitative, appear on column 3. Most and least preferred levels of each measure are shown on columns 4 and 5.

Two of the measures – Impact on Coast Guard Station, Bike and Pedestrian Access and Acceptance by NS, shown in dark red in **Table D.1 (Appendix D)** – were deemed non-negotiable. They were therefore treated as pre-screening criteria for the proposed alternatives. Any alternative rated ‘’no” on the measure ‘’Acceptance by Norfolk Southern” was eliminated from further consideration; the same goes for any alternative rated “yes” on the measure ‘’impact on Coast Guard Station”; and for any alternative rated “no” on the measure “provide bike and pedestrian access”. These measures are not shown on subsequent tables and figures.

The four project alternatives under consideration had identical ratings on each of the measures shown in purple. As a result, these measures do not affect the ranking of the alternatives and, for simplification, were eliminated from the analysis. They are not shown on subsequent tables and figures.

Project alternatives fall within the ranges of least and most preferred levels on each measure; these ranges were based on information provided by AECOM experts in the appropriate technical areas.

The structure of the alternative evaluation problem, after elimination of measures as explained in the preceding paragraphs, is illustrated in **Figure D.1 (Appendix D)**. The overall objective – Best Long-Term Solution for Willow Avenue Lift Bridge – appears on the left. Criteria are represented by rectangles, and the measures selected to evaluate each criterion by ovals.

Table 4 displays how adjacent property owner concerns were addressed in the MCDA framework and analysis. The table does not include the non-negotiable measures or measures which had identical ratings. These measures as indicated with red and purple text, respectively within **Table D.1 (Appendix D).**

Table 4. Adjacent Property Owners

Adjacent Property Owners	Access to South Whiskey Island	Project Cost	Long Term Operation & Maintenance (Q&M) Cost	Aesthetics	Bridge Design	Geotechnical Design	Roadway Geometry	Site Security	Environmental Justice	Noise	Regulated Materials	Improvement Implementation	Design Life	Operations and Efficiency	Vehicular and Maritime	Conflict Points, Truck Traffic	Economic Development
Cargill Deicing Technology	✓						✓	✓				✓		✓	✓		
Ontario Stone Corporation	✓						✓	✓		✓		✓		✓	✓	✓	
Canadian Silica Industries Inc.	✓						✓	✓				✓		✓	✓		
Norfolk Southern Railroad															✓		
Cleveland Metroparks	✓						✓			✓					✓		
Cuyahoga Metropolitan Housing Authority									✓	✓					✓	✓	✓
The Great Lakes Towing Company	✓											✓			✓		
The Cleveland Water Department								✓							✓		
Northeast Ohio Regional Sewer District															✓		
Cleveland Public Power Substation		✓													✓		
Port of Cleveland/Bulk Terminal															✓		
Whiskey Island Marina/Sunset Grille/Whiskey Island Still & Eatery															✓		
Ivancic Marine/Channel Park Marina															✓		
Olde River Yacht Club															✓		
Cleveland Area Soap Box Derby															✓		

6. Alternatives

AECOM was contracted to study the feasibility of alternative access routes to South Whiskey Island and to develop a preferred long-term solution/alternative for the rehabilitation or replacement of the existing Willow Avenue Vertical Lift Bridge. Within this study, AECOM evaluated 2 temporary and 36 permanent alternatives to provide reliable access to South Whiskey Island. Of the alternatives evaluated, four permanent alternatives were selected for further consideration.

The following is a list of all the temporary and permanent alternatives considered. Alternatives selected for further consideration are discussed in **Section 7**. Descriptions and figures for all remaining alternatives are included in **Appendix C.**

Temporary Access

The temporary access alternatives are intended to provide temporary emergency access to businesses on South Whiskey Island in case of loss of access from the Willow Avenue Lift Bridge.

- Alternative 1 – Temporary Access Route using the “Mouse Hole”
- Alternative 1A – Temporary Access Route with Two At-Grade Railroad Crossings

Long-Term Access

- Alternative 2 – Access from Crescent Avenue
- Alternative 3 – Access along Whiskey Island Drive
- Alternative 4 – Existing Willow Lift Bridge Rehabilitation
  - This alternative was progressed forward, see **Section 7.1** for additional information.
- Alternative 5 – New Old River Crossing
- Alternative 5A – New Old River Crossing from Division Street to Cargill
- Alternative 6 – New Access from Shoreway North of West 54th Street, Stay South w/ At-Grade Crossings
- Alternative 7 – New Access from Shoreway North of West 54th Street, Stay North, Use “Mouse Hole” and At-Grade Crossing Near Existing Bridge
- Alternative 8 – New Access from Shoreway at West 54th Street, Stay South w/ At-Grade Crossings
- Alternative 9 – New Access from Shoreway at West 54th Street, Stay North with Bridge over NS Mainline, Use “Mouse Hole” and At-Grade Crossing Near Existing Bridge
- Alternative 10 – New Access from Shoreway at West 54th Street, Stay South at Minimum Offset from NS Mainline w/ At-Grade Crossings
- Alternative 11 – New Access from Shoreway North of West 54th Street, Stay South at Minimum Offset from NS Mainline w/ At-Grade Crossings
- Alternative 12 – New Access from Shoreway at West 54th Street, Stay North with Bridge over Pump House and NS Mainline, Use “Mouse Hole” and At-Grade Crossing Near Existing Bridge
- Alternative 13 – New Access from Shoreway South NS Mainline Tracks, Stay South at Minimum Offset from NS Mainline w/ At-Grade Crossings
- Alternative 14 – Access from Existing West 45th Street, along Soap Box Derby, Stay North with Bridge over Pump House and NS Mainline, Use “Mouse Hole” and At-Grade Crossing Near Existing Bridge
- Alternative 15 – New Lift Bridge Adjacent to Existing Willow Avenue Lift Bridge
  - This alternative was progressed forward, see **Section 7.2** for additional information.
- Alternative 16 – New Bascule Bridge at Mulberry Avenue
  - This alternative was progressed forward, see **Section 7.3** for additional information.
- Alternative 17 – New Access from Shoreway North of New NEORSD Pump Station, Stay South at Minimum Offset from NS Mainline w/ At-Grade Crossings
- Alternative 18 – Cross NS Mainline Tracks with Existing Underpass to Marinas
- Alternative 19 – Cross NS Mainline Tracks with New Underpass to the East of the Existing Underpass to Marinas, Use “Mouse Hole” and At-Grade Crossing Near Existing Bridge
- Alternative 20 – Stay South from NS Mainline Along Existing Marina Access Drive w/ At-Grade Crossings
- Alternative 21 – New Access from Shoreway at West 54th Street, Stay North with Bridge over Pump House and NS Mainline, New Underpass East of “Mouse Hole” w/ At-Grade Crossings
- Alternative 22 – New Access from Shoreway South NS Mainline Tracks, Stay South at Minimum Offset from NS Mainline with a Bridge Over Bulk Terminal Tracks and At-Grade Crossing Near Existing Bridge
- Alternative 23 – New Access from Shoreway South NS Mainline Tracks, Stay South at a Minimum Offset from NS Mainline to Existing Bridge with a Bridge Over Bulk Terminal Tracks and At-Grade Crossing Near Existing Bridge
- Alternative 24 – New Access from Shoreway South NS Mainline Tracks, Stay South at Minimum Offset from NS Mainline then between Cargill and Bulk Terminal tracks and At-Grade Crossing Near Existing Bridge
- Alternative 25 – New Access from Shoreway South NS Mainline Tracks, Stay South at Minimum Offset from NS Mainline, Along Cargill Siding Tracks with At-Grade Crossings
- Alternative 26 – Access from Existing West 45th Street, New Fixed Bridge over the Old River, Loop Down to Meet Existing Grade on Ontario Property
- Alternative 27 – Access from Existing West 45th Street, along Soap Box Derby, Stay South at Minimum Offset from NS Mainline, to Existing Bridge then Bridge over “Mouse Hole” and At-Grade Crossing Near Existing Bridge
- Alternative 28 – New Access from Shoreway at West 54th Street, Stay North with Bridge over NS Mainline, Adjacent to Whiskey Island Drive, Use “Mouse Hole” and At-Grade Crossing Near Existing Bridge

- Alternative 29 – New Access from Shoreway South of West 54th Street, New Fixed Cable Stayed Bridge
- Alternative 30 – Truss and Plate Girder Fixed Bridge
- Alternative 31 – Haunched Plate Girder Fixed Bridge
- Alternative 32 – New Access from Shoreway, South of West 54th Street, New Fixed Bridge Aligned with Marina Docks
- Alternative 33 – New Fixed Bridge at West 45th Street
- Alternative 34 – New Access from Herman Avenue Bridge, Along Soap Box Derby, Stay South from NS Mainline, Bridge over Cargill Siding Tracks
- Alternative 35 – Access from Existing West 45th Street, Along Crescent Avenue, New Fixed Bridge over Old River, Cross NS Mainline Tracks with Existing Marina Underpass, Along Whiskey Island Drive, New Fixed Bridge Loop over NS Mainline Tracks
- Alternative 36 – New Fixed Bridge at State Street
  - This alternative was progressed forward, see **Section 7.4** for additional information.

7. Alternatives Evaluated with MCDA

The following are the four alternatives that did meet the initial screening criteria. First, for an alternative to be fully considered with the MCDA, it must meet the Purpose and Need (**Section 3.7**). Additionally, the alternative must have a feasible method to maintain access to South Whiskey Island while constructing the alternative. Any alternative which impacted the Coast Guard Station or did not provide bike and pedestrian access were also not included. Lastly, the alternative needed to receive support from NS. Figures for all of these alternatives are located in **Appendix B**.

Any proposed NHS route revisions must be initially requested by the NOACA Board. Once approved, the NOACA Board would submit their Board Resolution to the ODOT District 12 office for further processing to FHWA.

7.1 Alternative 4 – Existing Willow Avenue Lift Bridge Rehabilitation

Alternative 4 is to rehabilitate the bridge in its current location. This option may have the least amount of cost initially, but it may not fully address the long-term unreliability issue that is so desired. Also, maintaining access across the bridge while major rehabilitation work is being performed is difficult. Limited and scheduled closures may be required. The construction of this alternative would take approximately four months with the maintenance of traffic scheme discussed below. Reference **Appendix B** for plans showing Alternative 4.

Key Facts

- Estimated project cost is $53.1 Million. Cost is an estimated project cost which includes not only construction but also construction engineering, preliminary engineering, R/W acquisition and inflation. Operation and maintenance costs are not included. See **Appendix L** for a cost breakdown.
- The traffic patterns are not revised from the current situation, but this bridge requires staffing by an operator 24 hours a day, 7 days a week and 365 days per year. The bridge would be very expensive to build, maintain and to operate on a daily basis.
- Long-term operations and maintenance costs are estimated at $300,000 per year.
- Staging areas for cranes and equipment storage are assumed and R/W and easements would be needed.
- Raises vertically approximately 100 feet over the Old River.
- Span is over 300 feet long.
- Grades are 5-percent up and down across the structure.
- Requires coordination and a Section 9 permit with the USCG because the bridge crosses over navigable water.
- 35 Year Design Life

Traffic

The proposed truck route and traffic patterns remain the same as existing. This alternative would not alter the existing traffic operations along the Shoreway and surrounding streets and therefore traffic analysis was not performed.

Roadway and Drainage

The design criteria used are according to and meet City standards. The design speed is 25 mph. New pavement is assumed to be concrete pavement.

The geometry of the existing roadways is not affected. Roadway resurfacing and full-depth pavement repairs are included along Center Street, River Road and Elm Avenue from the existing bridge to the Shoreway.

According to the information available, the existing roadway approaches to the existing Willow Avenue Lift Bridge meet minimum design criteria for 25 mph. The trucks are known to “bounce” on the bridge, so the current roadway approaches should be further investigated with field survey if this alternative is chosen and moves to final design.

No drainage work is required, existing drainage patterns will be maintained, and AECOM did not become aware of existing drainage issues. In general, the existing project site drains to Old River. The project construction activities would fall under the “Routine Maintenance” category. *“Full Depth Pavement Repair/Replace – repairs to existing roadway with no changes to the purpose, horizontal alignment, or hydraulic capacity of the roadway. Full depth pavement replacement is considered a routine maintenance activity as long as no additional impervious area is added outside of the existing edge of the paved roadway.”* Therefore, according to Section 1115 of the ODOT Location and Design Manual (L&D) Volume 2, Post-Construction Storm Water Best Management Practices (BMPs) are not required.

Bike and Pedestrian

The proposed bike and pedestrian route will remain the same as existing. A cantilever to widen the existing sidewalks to accommodate the Cleveland Metroparks Centennial Trail Lake Link is not included. The existing bridge includes a 3’-7” sidewalk on both the west and east sides.

Environmental

Since this alternative simply rehabilitates the existing lift bridge on current alignment, it has the lowest environmental impacts. No bat habitat, streams, or wetlands will be affected. Wendy Park is not affected. No new alignment on parcels with regulated materials concerns is required. No new noise receptors will be impacted, and the alignment is not brought nearer to areas of underserved populations.

Structural

Background

The recommended actions for the alternative of a major rehabilitation of the bridge are based on reviewing condition reports from a 2016 in-depth inspection of its structural, mechanical and electrical systems, a 2016 underwater inspection and scopes of work that were performed on it during previous rehabilitations and repair projects. A bridge inspection was not part of the scope for this study.

Additionally, to best promote ongoing reliability, regular and systematic maintenance would need to be performed on elements of the bridge critical to its operation including but not limited to such components as its operating machinery, span support system, skew control devices, span guides, air buffers and span locks.

A major rehabilitation project for the bridge would extend its reliable operation for approximately an additional 35 years at which time additional work would likely need to be performed on the bridge that would then be approximately 85 to 95 years old, including most of its structural elements of its movable superstructure, the towers and their supporting substructures and many of the mechanical and electrical components. For additional background information see **Section 3.6**.

Mechanical System

The northwest trunnion bearings have had a history of being problematic, being replaced once in 2000 and again as an emergency repair in January 2017. The cost for bearing procurement and bearing removal and replacement during 2017 was approximately $1,100,000. Being of an urgent nature, the inside and outside northwest bearing repair consisted of an "in-kind" only replacement. Those bearings are of an older vintage, being cylindrical type roller bearings with thrust resistors, are problematic and continue to pose a concern to the long-term reliability of bridge operation. Noise has historically been heard and continues to emanate from the trunnion bearings and an issue with them in any of the four tower quadrants has the potential to develop in the future.

Bearings for sheave trunnions on modern vertical lift bridges typically consist of a spherical type. Replacing all eight bearings, one on the inboard side and one on the outboard side in each of the four quadrants with modern spherical type bearings would be recommended as part of a long-term rehabilitation to enhance long-term operational reliability of the bridge. With the new bearings having a different configuration from the existing roller bearings, modifications of the supporting structural elements for them on the towers would also be needed.

Lubrication of the trunnion shaft bearings has also been problematic over the years. A proactive regular greasing program and monitoring of the condition of purged grease as part of a future routine maintenance program would also help promote long term reliability of the bridge.

After observing degradation of their anchoring sockets, all the forty counterweight wire ropes consisting of ten in each bridge quadrant were replaced during 2017. Those recently installed ones should provide reliable service for approximately 40 to 50 years. Therefore, additional work on them other than periodic cleaning and lubricating would therefore not be required as part of a long-term rehabilitation project.

The tooth surfaces of the southwest curved rack gear and mating pinion exhibit heavy pitting and should be polished. All the machinery brakes brake wheels exhibit surface rust on the wheel surfaces.

As part of a 2010 rehabilitation project for the bridge, the brakes were replaced and the live load supports, centering devices and air buffers were rehabilitated.

Although still functional, many of the mechanical components of the operating machinery are original to the bridge and exhibit some signs of wear that is consistent with their age.

Structural System

The concrete deck of the fixed tower spans was replaced as part of a 2010 rehabilitation and are in good condition. The steel grid deck of the lift span was also replaced at that time and remains in good condition except for the concrete infill of the grid over the floorbeams and the ends of the span where spalling is exhibited. In conjunction with the replacement of the steel grid system, the supporting stringers of the lift span were also replaced and remain in good condition. However, the floorbeams of the lift span were not replaced as part of that recent grid replacement project and being exposed to salt laden water from the roadway above exhibit extensive areas of deterioration, pack rust and section loss. The lower lateral bracing system that is also situated beneath to open steel grid is heavily deteriorated. Replacing of the floorbeams which span the entire width of the roadway deck would be costly and challenging because the stringers and grid that they support would have to be temporarily disconnected and removed, with the bridge being closed to roadway traffic during that time.

The primary members of the lift span truss are the original ones and generally remain in sound condition. The paint system on numerous elements of the overall structure exhibits deterioration. That original protective coating system includes a red-lead based primer that would be costly to remove as part of blast-cleaning and repainting the structure.

The surface coating of the paint system has failed throughout the tower with red primer visible at most locations and light surface corrosion present, primarily on the underside of horizontal members.

Timber elements of the fender system along the front of the south bulkhead are deteriorated with some exhibiting vessel collision damage. Steel elements connecting the timber components to the steel sheeting of the south bulkhead are also corroded and deteriorated. Portions of the steel sheeting for the north bulkhead is cut off below the surrounding grade with embankment material extending over and in front of it. For portions of the north bulkhead sheeting that do extend above the ground surface at the west end and east end, elements of the facing timber section there deteriorated and split.

Electrical System

Based on the 2016 in-depth inspection report for the bridge, the electrical equipment in general was summarized to be in poor condition. The bridge control and traffic safety system were considered to be in poor condition. Many electrical components are old and obsolete and considered to be in poor condition. Rigid metallic conduits throughout the bridge is heavily corroded and in poor condition. PVC coated RMC is poorly supported above the span. Many electrical components are old and obsolete and considered to be in poor condition. The lighting throughout the bridge is inadequate. The lift span does not have lightning protection or aviation obstruction lighting.

Several electrical components were replaced as part of a 2010 rehabilitation project. Replacement components included speed drive controllers and drive motors on each tower, disconnect switches for new brakes, control system and control console, traffic barrier gates, and the CCTV system.

Geotechnical

Since this alternative simply rehabilitates the existing lift bridge on current alignment, no geotechnical work is required.

Maintenance of Traffic

A critical consideration for performing rehabilitation and repair work on the bridge is maintaining its ability to be used each day by vehicles to access South Whiskey Island and to maintain maritime access along Old River. Also, any work that requires the lift span to be inoperable as a movable structure can only be performed during a limited period of the late fall to early winter season, when marine traffic is not using the waterway.

To limit scheduled closures, a temporary single leaf bascule bridge is proposed to maintain traffic during construction. The expeditious schedule of three to four months will reduce the burden on the businesses. Most of the work can be performed in the winter, other than concrete work. The bearing work, for example, could be completed in the winter. The deck work can be completed at the end of the three to four-month rehabilitation schedule when the weather begins to warm up. Freighters and recreational boaters will not be present at this time. Completing the work from within late fall to early winter would be ideal.

The temporary single span bascule bridge will not prohibit truck or navigational traffic and can open and close in a couple of minutes. Since the temporary bridge will not remain in the final condition, the mechanical devices and electrical systems will be minimal to reduce the work required. An open deck system will also be utilized to minimize the weight. The bridge will not span the entire navigational channel and short approaches will be used to minimize cost and operational time.

AECOM met with the USCG on December 13, 2019 to discuss this approach for maintaining traffic. The USCG noted that while this type of structure is not common on the Great Lakes, it is in practice and they agree with the method and type of structure. They also noted that a temporary bridge would be subject to the NEPA and full permit process as if it were a permanent bridge. The United States Army Corps of Engineers (USACE) would require the most coordination due to the amount of work required within Old River, to minimize the temporary span. The Ohio Department of Natural Resources (ODNR) and the State Historic Preservation Offices (SHPO) should be relatively straightforward.

If the temporary bridge were to be placed at the bend near the existing bridge, a minimum navigational channel of 150 feet would be required to be maintained by the USCG. AECOM stated that the maximum span allowed for the temporary single leaf bascule bridge is 120 feet to 130 feet. The USCG agreed that 120 feet to 125 feet would be sufficient, with unlimited vertical clearance, but they need to verify with the users of Old River. AECOM confirmed that the temporary bridge would provide a 90-degree unlimited vertical clearance.

Potential staging areas are provided on the north and south sides of Old River.

Utilities

Due to the nature of the work required for the rehabilitation of the lift bridge, no major utility relocations are anticipated. However, the potential staging areas for this alternative do interfere with some existing utilities and are included in the cost estimate. The north staging area interferes with one light pole, and the south staging area interferes with two electric utility poles, both with boxes.

7.2 Alternative 15 – New Lift Bridge Adjacent to Existing

Alternative 15 is to build a new vertical lift bridge next to the existing structure. It would be a new vertical lift bridge just like the existing. The status of the existing Willow Avenue Lift Bridge is abandoned. The construction of this alternative would take approximately two years. Reference **Appendix B** for plans showing Alternative 15.

Key Facts

- Estimated project cost is $166.9 Million. Cost is an estimated project cost which includes not only construction but also construction engineering, preliminary engineering, R/W acquisition and inflation. Operation and maintenance costs are not included. See **Appendix L** for a cost breakdown.
- The existing Willow Avenue Lift Bridge is abandoned.
- The current traffic patterns are not significantly revised from the current situation, but this bridge requires staffing by an operator 24 hours a day, 7 days a week and 365 days per year. The bridge would be very expensive to build, maintain and to operate on a daily basis.
- This alternative would have a long-term operations and maintenance cost estimated at $300,000 per year.
- The location is east of the existing bridge, so the bridge may be required to raise more often when maritime vessels navigate the bend along the Cuyahoga River or dock at the slip east of the existing bridge.
- Requires coordination and a Section 9 permit with the USCG because the new proposed bridge crosses over navigable water.
- An Ontario Stone building will require being demolished or relocated. This is not their main office building.
- Ontario Stone and Pennsylvania Lines, LLC property acquisition would be required.
- Staging areas for cranes and equipment storage are assumed and R/W and easements would be needed.
- Like the existing structure, it would raise vertically approximately 100 feet over the Old River.
- Span is over 300 feet long
- Grades would be approximately 5 and 6-percent across the structure (similar to existing).
- Two 13-foot lanes across the structure.
- 10-foot shared-use path on the structure on the west side.
- Barrier separating trucks and bike/pedestrians across the structure.
- New concrete roadway with curbing.
- 75 Year Design Life

Traffic

The proposed truck route and traffic patterns remain the same as existing except moved over slightly for alignment of new adjacent lift bridge. This alternative would not alter nor is anticipated to impact the existing traffic operations along the Shoreway and surrounding streets and therefore, no traffic analysis was performed.

Roadway and Drainage

The design criteria used are according to and meet City standards. The design speed is 25 mph. New pavement is assumed to be concrete pavement.

The geometry of the existing roadways is not affected except along Elm Avenue where the new bridge is located east of the existing. New full-depth pavement is required at each approach due to the new alignment. Outside of the new pavement, roadway resurfacing, and full-depth pavement repairs are included along Center Street, River Road and Elm Avenue from the existing bridge to the Shoreway. Bridge operator parking is provided on the north side of Old River.

Minimal drainage work is required, and existing drainage patterns will be maintained. In general, the existing project site drains to Old River. The project earth disturbed area (EDA) is less than one acre. Therefore, according to Section 1115 of the ODOT L&D Volume 2, BMPs are not required.

Bike and Pedestrian

The proposed bike and pedestrian route will remain the same as existing except moved over slightly for alignment of new adjacent lift bridge. A 10-foot wide shared-use path along the west side of the bridge is included to accommodate the Cleveland Metroparks Centennial Trail Lake Link.

Environmental

Since this alternative lies near Alternative 4, it also has similar low environmental impacts. No bat habitat or wetlands will be affected. The Old River will be crossed at a new location, but since the stream will be spanned, impacts below the Ordinary High-Water Mark should be minimal. Requires coordination and a Section 9 permit with the USCG because the bridge crosses over navigable water. Wendy Park is not affected. No new alignment on parcels with regulated materials concerns. No new noise receptors will be impacted, and the alignment, although new, is not brought nearer to areas of underserved populations. There are no adverse impacts to historic sites. The historic sites are shown with red dots on **Map F.2 in Appendix F**.

Structural

Location

The new structure would be approximately 90 feet further east from the existing bridge. The 90 feet is measured from center of existing to center of new structure.

Type of Replacement Movable Bridge

With the overhead structural members required in a vertical lift structure, the operators view could be obstructed which may require additional cameras to ensure that views of the roadways on the bridge as well as its approach roadways are available. There is a possibility of eliminating the need for a truss for the lift span by constructing a “tabletop” lift bridge. A tabletop lift bridge contains a lift span that is made of girders (deck or through girders) due to the shorter lift span length. However, the depth of the lift span girders could be investigated to determine if a girder lift span allows enough under clearance for small vessels to pass without a bridge opening. Other checks would be necessary such as deflection, etc.

Considering a lift bridge similar to the existing vertical lift bridge, the structure would be comprised of lift towers on both sides of the navigational channel with height required to provide the necessary vertical clearance for the navigational channel. The height of the towers would be approximately the required vertical under clearance plus the depth of the lift span truss plus two times the sheave diameter.

The lift span would be a steel through truss structure which is raised vertically by wire lift ropes that run to the top of the towers, pass over sheaves and then connect to counterweights contained within each of the towers. These counterweights lower as the lift span raises and provide a proper balance so that the lift motors only need to overcome friction and a small amount of imbalance to lift the structure. Typically, this imbalance is created to be heavy on the span side such that the lift span can be lowered by gravity in case of a power outage during a lift operation. Auxiliary counterweights are also provided to account for the weight of the steel lift ropes as they pass over the sheaves.

One of the primary benefits of a vertical lift structure is that the weight of the span itself can be reduced as compared to a bascule structure because the truss is a more efficient means of carry forces. The use of a truss also limits the depth of structure required below the roadway significantly as only the floorbeams and stringers are below the deck and the truss itself is above the roadway. Reducing the depth of structure is beneficial as it also limits the need to raise the approach roadway profile by means of a vertical curve with retaining walls. Although there are cost savings by limiting the need to adjust approach roadway profile, these costs will be more than offset by the additional costs required to erect the large towers required. The lift span also is considered a simple span when the bridge is down and eliminates the complicated locking systems when the span is in the lowered position.

Deck Configuration

Consistent with the cross section of the existing bridge, the 26-foot curb-to-curb width of the deck for a new movable bridge would accommodate one traffic lane in each direction. A traffic barrier provided along the northbound lane would provide positive separation for an adjacent 10-foot wide shared-use path along the west side of the bridge.

An open steel grid would be the most cost-effective deck system to provide for the roadway of a new vertical lift bridge. This system would have the lightest unit weight, thereby limiting the amount of counterweight required to balance it. There are numerous steel grid deck systems available. With the large number of heavy trucks that need to cross the waterway, the most robust heavy-duty steel grid system would be recommended for strength and low fatigue stress range. The underlying structural framing system supporting the grid would be galvanized to promote longevity. Additionally, the deck grating may also be half filled steel grating with a light or normal weight concrete which can be slightly overfilled. This will protect the steel below the grating and can provide a smoother and quieter riding surface. Providing bolted connections between the steel grid deck and supporting structural members would enable any potential need to expeditiously and cost effectively replacement any of those elements in the future.

The shared-use path on the west side of the bridge would have a solid surface and can also be partial filled steel grating. A traffic barrier providing positive separation from the adjacent traffic lane, the shared-use path would not have to accommodate heavy wheel loads. Cost-effective, light-weight and long-lasting options for this surface could include a steel plate with slip-resistant coated surface or a fiberglass deck system which is becoming a more common design.

Fender System

A system of steel sheeting running along and the tied to the faces of the lift tower piers with granular fill placed between it and those piers would provide a cost effective, long lasting and robust protective system for the bridge to resist loads from any errant vessels. Design of the lift towers can also be designed to accommodate some level of vessel collision loading.

Span length

A 310-foot distance face to face of the lift towers, similar to the existing, for a vertical lift structure would provide a length sufficient to span the required 157-foot navigation channel plus the fender systems.

Operator and Machinery Houses

In one of the towers, an operator house would be cantilevered off the tower. It would contain electrical and control system equipment for the bridge. By providing the control console in the house above the roadway level, the operator would have a clear view of portions of the bridge and approach roadway and waterway with possibly CCTV cameras providing a view of the remaining obstructed areas. A smaller machinery house can also be constructed in the opposite tower to house the driver controls and switchgears for that tower. Additional enclosures would be constructed atop of each tower to house the driver machinery with associated shafts, reducer gear sets, locks, skew controls and sheaves.

Electrical and Control System

A programmable logic controller (PLC) based operating and control system would be provided to promote speed of bridge opening, closing, provide reliable functioning of the bridge's protective interlocking system and basically have “one button” operation. It would also support data collection for monitoring and trouble-shooting the bridge's operation and enable the potential to remotely operate it. Typically, two PLC systems are installed (primary and secondary) for backup operation.

To ensure uninhibited bridge operation during any electrical service outage, a redundant power supply would be provided. This could consist of an on-site generator or a second electrical service feed if a second independent one is available from the electrical utility.

Cables would be provided across the structure spanning between the top of the towers which eliminates the need for any submarine cables. These cables provide electrical power and control to the operating machinery and traffic gates and bridge signals on the opposite side of the waterway from the operator house. Redundant cables can be installed as well.

Because there is no protection provided to vehicles on the approach roadway when the structure is lifted, traffic crash barriers to provide positive restraint to vehicles would be required to protect traffic.

Camera's viewing all areas obstructed from the control house of the roadway and waterway approaches to the bridge would promote safety. Monitors for those cameras could be positioned directly above the control console to provide the operator direct views from each camera at all times while operating the bridge.

Geotechnical

The existing Willow Avenue lift bridge is supported on a system of driven battered piles and vertical drilled piers bearing within the shale bedrock (more than 150 ft below the top of bank). This is an adequate but likely expensive foundation system by today’s standards. For the new bridge, a system consisting only of driven piles would provide a more efficient foundation system. HP-section piles bearing in the hard till deposit (stratum top elevation is estimated to be in the vicinity of 510 ft in the area of the bridge) will provide a balance

between high capacity/efficiency and pile length for moderate foundation loads. Nominal pile capacities as given in the ODOT Bridge Design Manual (BDM) can likely be achieved with 10-20 ft of penetration into the till layer. Piles driven into the till will derive their capacity as a combination of skin friction and tip resistance. It should be noted that the lacustrine clays in the area (which will provide much of the skin friction resistance) undergo a very strong setup effect with respect to driven piles – we have measured end of initial drive capacities that are only 50% (or even less) of the ultimate capacity after setup. Setup typically takes a period of 2 to 4 weeks. As such, the construction schedule will need to accommodate restrike testing of piles, performed several weeks after initial pile driving.

If foundation loads will be very high, use of larger HP sections driven to shale bedrock (estimated stratum top elevation will be in the range of 427 to 417 ft) could be a more efficient arrangement. Piles driven to refusal on bedrock could be designed to carry 60% of their yield strength, resulting in high single pile capacities and a very efficient foundation system. This approach was taken, for example, on the George Voinovich Bridge (I-90 EB over the Cuyahoga River).

As long piles will be necessary to reach a suitable bearing stratum, lateral pile capacity is unlikely to control the foundation design, unless very high lateral loads will be applied by the bridge.

The surface fills and underlying lacustrine soils are soft, compressible materials. If significant grade changes will be required approaching the bridge (using embankments and/or retaining walls), the potential for settlement of these strata will be fairly high. Preloading programs, use of lightweight fills, or use of wick drains to accelerate consolidation may be necessary.

Maintenance of Traffic

A new movable bridge could be constructed at this location while the existing lift bridge remains in service. Uninhibited navigation could be maintained throughout nearly all of construction for a new vertical lift structure. The towers would be constructed outside of the waterway with no impacts to navigation. The structural system connecting the top of the towers would be erected above the navigation channel with outages only required when steel is being lifted into place. The lift span truss itself would be pre-assembled nearby on barges and then floated into position and connected to the wire ropes significantly limiting any impacts to the navigation channel.

Potential staging areas are provided on the north and south sides of Old River.

Utilities

The proposed roadway north of the proposed lift bridge will require the relocation of one electric utility pole, while the proposed roadway to the south requires the relocation of one electric utility pole and one water utility valve access.

7.3 Alternative 16 – New Bascule Bridge at Mulberry Avenue

Alternative 16 is to build a double leaf bascule bridge at a site upstream from the current structure where the Old River channel is narrower. The status of the existing Willow Avenue Lift Bridge is abandoned. The construction of this alternative would take approximately two years. Reference **Appendix B** for plans showing Alternative 16.

Key Facts

- Estimated project cost is $53.2 Million. Cost is an estimated project cost which includes not only construction but also construction engineering, preliminary engineering, R/W acquisition and inflation. Operation and maintenance costs are not included. See **Appendix L** for a cost breakdown.
- The existing Willow Avenue Lift Bridge is abandoned.
- Site security measures may be required due to the MSHA regulations required for Cargill, Ontario Stone and Csi. Measures may include fencing, netting, barriers and video surveillance.
- The current traffic patterns are not significantly revised from the current situation, but this bridge requires staffing by an operator 24 hours a day, 7 days a week and 365 days per year. The bridge would be expensive to build, maintain and to operate on a daily basis.
- This alternative would have a long-term operations and maintenance cost estimated at $300,000 per year.
- Ontario Stone property will be required.
- A new truck movement along River Road is required.
- We are proposing a barrier to prevent trucks from using Mulberry Avenue as that is not the current truck route.
- Staging areas for cranes and equipment storage are assumed and R/W and easements would be needed.
- The required span is over 161 feet long to span the 114-foot wide navigational channel at this location. The span is reduced compared to the lift bridge alternatives, but still outside the USCG defined navigational channel. Requires coordination and a Section 9 permit with the USCG because the new proposed bridge crosses over navigable water.
- Grades would be approximately 1-percent across the structure.
- Two 13-foot wide lanes across the structure.
- 10-foot wide shared-use path on the structure on the east side.
- Barrier separating trucks and bike/pedestrians across the structure.
- New concrete roadway with curbing.
- 75 Year Design Life

Traffic

The proposed truck route and overall traffic patterns remain the same as existing except the access to South Whiskey Island is moved further south along River Road for the new bascule bridge. Traffic operations along the Shoreway and surrounding streets should not be impacted.

Roadway and Drainage

The design criteria used are according to and meet City standards. The design speed is 25 mph. New pavement is assumed to be concrete pavement.

The geometry of the existing roadways is not affected except along River Road where the new bridge is in line with Mulberry Avenue. New full-depth pavement is required at each approach due to the new location. The alignment crosses Ontario Stone's southern property and stockpiles. New driveways for access to this Ontario Stone property are required. Approximately 75 percent of Ontario Stone's operations take place on this property. A new driveway for access to the Csi facility is also required. Outside of the new pavement, roadway resurfacing, and full-depth pavement repairs are included along Center Street, River Road and Elm

Avenue from the new bridge to the Shoreway. Bridge operator parking is provided on the east side of Old River.

The roadway approaches to the new bascule bridge are required to be raised compared to the existing grades. The new bascule bridge creates a vertical curve over Old River and the roadway slopes down away from the new bridge on each side to meet existing grade.

A proposed barrier heading eastbound from the new bridge to Mulberry Avenue is proposed to deter trucks from using Mulberry Avenue. Mulberry Avenue is not the current truck route. “No Truck” signage will be included. A crash wall is also included between the end of the west approach pavement and the NS siding tracks to protect the tracks from an errant vehicle.

Minimal drainage work is required, and existing drainage patterns will be maintained. In general, the existing project site drains to Old River. The proposed roadway will drain to proposed storm sewers. The storm sewers will be required to slope against the roadway grade to outlet to Old River and maintain existing drainage patterns.

The project earth disturbed area (EDA) is greater than one acre. Therefore, according to Section 1115 of the ODOT L&D Volume 2, BMPs are required. BMPs to address water quality are required while BMPs to address water quantity are not required. The project drains to Old River which drains directly to the Cuyahoga River and Lake Erie. The Cuyahoga River is a fifth order river according to ODOT’s TIMS website. Therefore, according to Section 1115.3 of the ODOT L&D Volume 2, the Cuyahoga River is considered a large river which is fourth order or greater. The current typical section follows the City standard and includes a curbed roadway and storm sewers. For this reason, a manufactured system would be an option to treat only water quality. The vegetated biofilters and vegetated filter strips would not work. Even if the typical section was revised to include ditches rather than curbs, the industrialized site provides very little opportunity for these vegetated treatments. If a manufactured system is not preferred, a system which treats both water quality and water quantity could be considered. The current options available on ODOT’s list include detention basin, retention basin, bioretention cell, infiltration trench, infiltration basin and constructed wetlands. New impervious area is created inside new permanent R/W, so the treatment required will be greater than 20 percent.

Bike and Pedestrian

The proposed bike and pedestrian route will be continued down Mulberry Avenue from the existing Centennial Trail Lake Link over the new bascule bridge. A 10-foot wide shared-use path along the east side of the bridge is included to accommodate the Cleveland Metroparks Centennial Trail Lake Link. From the new bridge, the shared-use path will be extended to meet the Cleveland Metroparks Wendy Park Bridge.

Environmental

Alternative 16 will not impact bat habitat or wetlands. The Old River will be crossed at a new location, and this alternative shows small bridge abutments slightly protruding into the Old River before spanning but impacts below the Ordinary High-Water Mark should still be minimal. Requires coordination and a Section 9 permit with the USCG because the bridge crosses over navigable water. Wendy Park is not affected. No new alignment on parcels with regulated materials concerns is required. Approximately 95 residents in nine HUD buildings lie within 400 feet of the new alignment and thus may experience noise impacts. The new bridge will not lie within 50 feet of underserved populations. There are no adverse impacts to historic sites. The historic sites are shown with red dots on **Map F.2 in Appendix F**.

Structural

Location

The optimum place for the alternative of a new movable bridge to replace the existing Willow Avenue Vertical Lift Bridge would be on the section of Old River that is oriented in a southwest to northeast direction in the vicinity of Mulberry Street. This location is situated along a tangent section of the waterway away from bends and would be less susceptible to variations in trajectories of larger vessels resulting from turning movements. Based on scaling of Old River at this location on NOAA Navigation Chart 14839 for Cleveland Harbor including Lower Cuyahoga River, the required width of navigational channel at this location is approximately 114 feet. The required width of the navigational channel on this section of the waterway was confirmed with the USCG during a meeting with that agency on November 28, 2018 and again on December 13, 2019. This width is substantially less than that required to accommodate vessels making turning movements in the section of the mouth of the channel in the vicinity of the existing lift bridge.

Type of Replacement Movable Bridge

A double leaf bascule structure would provide a cost-effective movable bridge replacement alternative for the 114-foot width of navigational channel to be spanned with costly massive support towers associated with a vertical lift bridge would not being required.

With overhead structural members, the operator would have uninhibited clear sight lines to the deck of the bridge as well as its approach roadways.

The mated bascule girders for the two bascule leaves when in the closed position would function as propped-cantilevered structural members for carrying traffic. With that configuration, the largest flexural moments would occur where the girders are the deepest – at their heel sections within the bascule substructure outside the navigation channel. The bascule girders could be most shallow at their mated tips at mid-span. This arrangement would therefore enable the bridge's superstructure to have its least depth, and provide the greatest freeboard, at the center of the navigation channel. This would provide the benefit of being able to accommodate passage of smaller recreational vessels that frequent the waterway to and from the marinas at the southwest end of the waterway without having to open the bridge.

To enable the deeper portion of the bascule girders to clear the front wall of the bascule substructures, a vertical curve would be required to provide a roadway profile across the bridge somewhat higher than that of the surrounding shoreline. Short retaining walls would be required to accommodate the roadway approaches with this elevated profile.

Style of Bascule Movable Bridge

The two primary styles of bascule bridges are the rolling lift and the trunnion. Rolling lift style bascules are supported on robust flat steel track forgings embedded into the concrete of the substructures. Curved steel tread forgings attached to the bottoms of the bascule girders mate with and roll on the tracks when the bridge opens and closes. Trunnion style bascules are supported on and rotate about large trunnion shafts that are supported by stationary bearing systems mounted on the substructures.

The required length of superstructure for a rolling lift style bascule structure is shorter than that of a trunnion style one. This is because the horizontal clearance across the waterway is achieved by a combination of the bascule leaves both rotating and translating backward when they roll open.

Rolling lift style bascule bridges do not have the massive trunnion bearing systems to maintain. Because of their simple rolling manner of operation, they also have the least amount of frictional resistance to movement that must be overcome by their operating machinery.

The counterweights for a rolling lift bascule leaf have a more compact trajectory as they descend into their containing pits within the supporting substructures. This enables smaller less costly bascule substructures to be used.

A rolling-lift style bascule would enable the use of Scherzer style centerlocks to be utilized for connecting the mated tips of each pair of main girders. Unlike mechanical centerlocks that are required for trunnion style bascules, these robust devices have no moving parts, do not require machinery to operate and require minimal maintenance.

For the above reasons, a rolling-lift style bascule structure is recommended for the movable bridge replacement alternative.

Deck Configuration

Consistent with the cross section of the existing bridge, the 26-foot curb-to-curb width of the deck for a new movable bridge would accommodate one traffic lane in each direction. A traffic barrier provided along the northbound lane would provide positive separation for an adjacent 10-foot wide shared-use path along the east side of the bridge.

An open steel grid with be the most cost-effective deck system to provide for the roadway of a new bascule bridge. This system would have the lightest unit weight, thereby requiring the small size of counterweight to balance. There are numerous steel grid deck systems available. With large number of heavy trucks that need to cross the waterway, the most robust heavy-duty steel grid system would be recommended. The underlying structural framing system supporting the grid would be galvanized to promote longevity. Providing bolted connections between the steel grid deck and supporting structural members would enable any potential need to expeditiously and cost effectively replace any of those elements in the future.

The shared-use path on the east side of the bridge would have a solid surface. A traffic barrier providing positive separation from the adjacent traffic lane, the shared-use path would not have to accommodate heavy wheel loads. Cost-effective, light-weight and long-lasting options for this surface would include a steel plate with slip-resistant coated surface and a fiberglass deck system.

Fender System

A system of steel sheeting running along and tied to the faces of the bascule substructures with granular fill placed between it and those piers would provide a cost effective, long lasting and robust protective system for the bridge to resist loads from any errant vessels.

Span length

A 161-foot distance between the supporting first positions of roll for a double leaf bascule would provide a length sufficient to span the required 114-foot navigational channel plus the fender systems situated between the channel lines and the bascule substructures.

Operator House

In one of the bridge quadrants, an operator house would be constructed integrally with one of the two bascule substructures. It would contain electrical and control system equipment for the bridge. By providing the control console in the house at one level above the roadway, the operator would have a clear and uninhibited view of the bridge deck, both approach roadways and the waterway.

Electrical and Control System

A programmable logic controller (PLC) based operating and control system would be provided to promote speed of bridge opening and closing and reliable functioning of the bridge's protective interlocking system. It would also support data collection for monitoring and trouble-shooting the bridge's operation and enable the potential to remotely operate it.

To ensure uninhibited bridge operation during any electrical service outage, a redundant power supply would be provided. This consists of an on-site generator or a second electrical service feed if a second independent one is available from the electrical utility.

Submarine cables would be provided beneath the bottom of the waterway to provide electrical power and control to the operating machinery and traffic gates and bridge signals on the opposite side of the waterway from the operator house.

Because the leaves of rolling lift bascules provide a barrier to the approach roadway when they roll open, costly traffic barriers to provide positive restraint to vehicles would not be required and only traffic warning gates and bridge traffic signals in advance of those gates would be needed.

Camera's viewing both the roadway and waterway approaches to the bridge would promote safety. Monitors for those cameras could be positioned directly above the control console to provide the operator direct views from each camera at all times while operating the bridge.

Geotechnical

Foundation considerations for this option are essentially the same as those for the New Lift Bridge Adjacent to Existing (Alternative 15). See **Section 7.2** for specific information.

Maintenance of Traffic

A new movable bridge could be constructed at this location while the existing lift bridge remains in service.

Uninhibited navigation could be maintained throughout nearly all of construction for a new bascule bridge. The heel portions of each leaf along with their counterweights and on-board operating machinery could be constructed in the closed position behind the front faces of the fender system. The front arms of each leaf could be concurrently pre-erected on nearby barges. For each leaf, during a minimal waterway closure of approximately one to two days, the front arm could then be floated into position and connected to the heel portion using bolted splices in the bascule girders. After attachment of the front arms, the temporary shoring system used beneath each counterweight could be removed and the leaf immediately rolled into the open position to allow for navigation. This construction step could be performed during the winter season when marine traffic is limited.

Potential staging areas are provided on each side of Old River.

Utilities

The proposed roadway off River Rd. aligned with Mulberry Avenue passes through the location of a string of transmission lines. One pole will require relocation.

7.4 Alternative 36 – New Fixed Bridge at State Street

Alternative 36 is to build a long-fixed bridge from Washington Avenue, across Old River, to South Whiskey Island. This bridge would go between the Lakeview Terrace neighborhood and the WTP. There is an old R/W that would be utilized. From old City records it is called State Street. The status of the existing Willow Avenue Lift Bridge is abandoned. The construction of this alternative would take approximately two years. Reference **Appendix B** for plans showing Alternative 36.

Key Facts

- Estimated project cost is $51.9 Million. Cost is an estimated project cost which includes not only construction but also construction engineering, preliminary engineering, R/W acquisition and inflation. Operation and maintenance costs are not included. Note that a life cycle cost analysis has not been performed, though it can be stated that maintenance costs will be less for a fixed bridge compared to a movable bridge. Conversely, user costs are likely to be higher for trucks using a fixed bridge with steep grades. See **Appendix L** for a cost breakdown.

- The existing Willow Avenue Lift Bridge is abandoned.
- Site security measures may be required due to the MSHA regulations required for Cargill, Ontario Stone and Csi. Measures may include fencing, netting, barriers and video surveillance.
- This alternative includes a “fixed” or non-moving structure. No staffing is necessary. However, traffic patterns may shift with these alternatives and R/W, or “land”, will need to be purchased to construct the improvements.
- Long-term operations and maintenance cost significantly decrease with a fixed structure and is estimated at $30,000 per year.
- Although this alternative reduces the amount of trucks through CMHA housing, Ontario Stone stockpiles 75% of their material on their southern property. Trucks accessing this southern property will remain active.
- For safety reasons, parking is eliminated along the new pavement on Washington Avenue. Locations to accommodate parking will need vetted in the future. One option could be to provide parking along and/or underneath the State Street Bridge.
- A noise barrier along the east side is added to the bridge near the Lakeview Terrace residences to minimize impacts.
- Due to the required placement of pier 2, Division Avenue will be disconnected from River Road.
- Cargill, and Ontario Stone property is required
- Requires coordination and a Section 9 permit with the USCG because the new proposed bridge crosses over navigable water.
- Aerial easements along the new bridge would allow the businesses to maintain access underneath the bridge
- Staging areas for cranes and equipment storage are assumed and R/W and easements would be needed.
- The new bridge provides over 80 feet of vertical clearance over River Road and over 90 feet of vertical clearance over existing Csi driveway.
- Span is over 2,350 feet long with 13 sets of bridge piers.
- Grades would be approximately 3-percent up to get 100 feet high over Old River, then 8-percent down.
- Two 12-foot wide lanes across the structure.
- On-street bike lanes across the structure, approximately 7.5’ wide.
- New concrete roadway with curbing.
- 75 Year Design Life

Traffic

This alternative involves utilizing the existing exit at West 28th Street. All existing traffic using the Willow Lift Bridge would still use the West 28th Street exit, but now turn right, then left onto Washington Avenue, instead of making the left onto West 28th Street as they do currently. Washington Avenue is changed from a dead end to a connection to the new fixed bridge extending from State Street. **Figure 1** below shows the Synchro layout that was used to analyze this alternative.

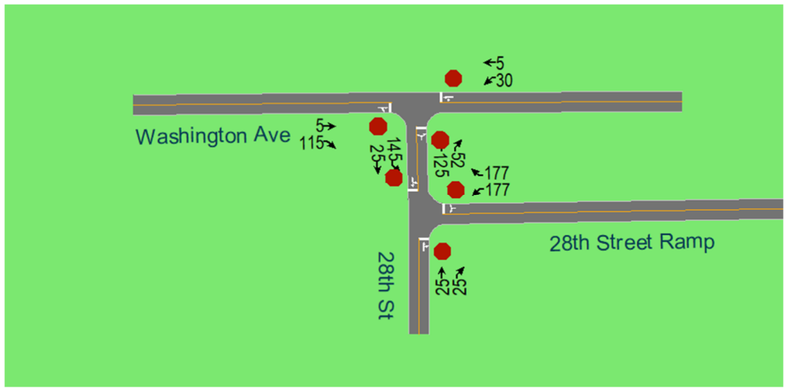


Figure 1. Alternative 36 Synchro Layout

Without traffic count data for the West 28th Street Ramp, the analysis is based on existing operation. The exit at West 28th Street is a one-lane stop controlled approach. The volume of traffic would not change, only the direction vehicles go. The trucks destined for South Whiskey Island currently take a left. In this scenario, they would now make a right. This alone would not impact operations at this intersection adversely. However, the proximity of the stop at Washington Avenue and the impact to left turns could negatively impact the West 28th Street/ramp intersection. The DHV used for West 28th Street ramp to the new bridge is 177. The assumed traffic to the new bridge is 100 vehicles each direction in the design hour, all assumed to be trucks.

Without existing data, trip generation based on the number of dwelling units in Lakeview Terrace was calculated. It is assumed the only traffic other than trucks destined to South Whiskey Island that would make the right off the ramp are mostly residents. The number of units in Lakeview Terrace and Lakeview Tower is 675 combined. We assume one-third of the residents use West 28th Street. Other access points as well as public transportation are likely utilized given the urban location and demographic. Based on the ITE 10th Edition Trip Generation Manual for Low Rise Multifamily Housing (Code 220), PM peak of adjacent traffic, 225 units would yield 122 trips (77 entering and 45 exiting). Based on housing locations, we assume one-third of the vehicles turn left at West 28th Street and Washington Avenue and two-thirds turn right (25 lefts and 52 rights). We assume the same distribution for exiting traffic, one-third from the west (15), two-thirds from the east (30). These values added to the assumed South Whiskey Island truck traffic yielded no traffic issues. Both the Washington Avenue at West 28th Street and West 28th Street at WB Shoreway ramp intersections yielded delays no longer than 13 seconds and LOS B or better on all approaches.

Again, it is important to note, a traffic count was not done in this area so the volumes analyzed may not accurately reflect existing traffic. Given the above analysis, if the intersections operate well today (LOS A or B), we expect they would continue to do so.

Truck traffic will access the new bridge from the West 28th Street exit off the Shoreway. Although this alternative reduces the amount of trucks through CMHA housing to River Road, Ontario Stone stockpiles 75 percent of their material on their southern property, off South Whiskey Island. Trucks will now be directed to take Washington Avenue through CMHA housing and trucks accessing this Ontario Stone’s southern property will remain active. This will reduce truck traffic to River Road significantly but not completely. Copies of all HCS and Synchro analysis reports are provided in **Appendix E**.

Roadway and Drainage

The design criteria used are according to and meet City standards. The design speed is 25 mph. New pavement is assumed to be concrete pavement.

New full-depth pavement is required along Washington Avenue from West 28th Street to accommodate truck traffic. No improvements to the Washington Avenue and West 28th Street are anticipated based on the AutoTURN analysis completed using a WB-62. A noise barrier along the east side is included on the bridge adjacent to the Lakeview Terrace residences to minimize impacts. Due to pier placement and proximity of numerous utilities, Division Avenue will be disconnected from River Road. A cul-de-sac is included for a vehicle turnaround. On South Whiskey Island, the bridge ends along existing drives which access Cargill and Csi. The truck turnaround is shown based on WB-62 and will require Csi trailers be relocated. Vehicles will then be able to use the existing drives to access the remaining portions of South Whiskey Island.

The roadway approaches immediately adjacent to the new bridge are required to be raised, compared to the existing grades, to allow the required vertical clearance over Old River. The new bridge creates a vertical curve over Old River and the roadway slopes down away from the new bridge on each side to meet existing grade.

Bridge deck and storm sewer drainage systems are required. In general, the existing project site drains to Old River. Existing drainage patterns will be maintained by providing an outlet for the proposed drainage systems to Old River and maintaining current storm sewer configurations on Washington Avenue.

The project earth disturbed area (EDA) is greater than one acre. Therefore, according to Section 1115 of the ODOT L&D Volume 2, BMPs are required. BMPs to address water quality are required while BMPs to address water quantity are not required. The project drains to Old River which drains directly to the Cuyahoga River and Lake Erie. The Cuyahoga River is a fifth order river according to ODOT's TIMS website. Therefore, according to Section 1115.3 of the ODOT L&D Volume 2, the Cuyahoga River is considered a large river which is fourth order or greater. The current typical section follows the City standard and includes a curbed roadway and storm sewers. For this reason, a manufactured system would be an option to treat only water quality. The vegetated biofilters and vegetated filter strips would not work. Even if the typical section were revised to include ditches rather than curbs, the industrialized site provides very little opportunity for these vegetated treatments. If a manufactured system is not preferred, a system which treats both water quality and water quantity could be considered. The current options available on ODOT's list include detention basin, retention basin, bioretention cell, infiltration trench, infiltration basin and constructed wetlands. New impervious area is created inside new permanent R/W, so the treatment required will be greater than 20 percent.

For safety, the parking has been removed along the new pavement on Washington Avenue. There are approximately 10 on-street and 20 parking spaces across Washington Avenue eliminated. Locations to accommodate parking will need to be evaluated. One option could be to provide parking along and/or underneath the State Street Bridge.

Bike and Pedestrian

The proposed bike and pedestrian traffic will be rerouted up Mulberry Avenue and Washington Avenue to connect to the new fixed bridge. 7.5-foot wide on-street bike lanes are provided to continue the shared-use path along both sides of the bridge. From the new bridge, the shared-use path will be extended to meet the Cleveland Metroparks Wendy Park Bridge.

Environmental

Alternative 36 will not impact bat habitat. This alternative passes near mapped wetlands and thus could have some impacts, but it is possible these wetlands could be avoided. The Old River will be crossed at a new location, but since the stream will be spanned, impacts below the Ordinary High-Water Mark should be minimal. Requires coordination and a Section 9 permit with the USCG because the bridge crosses over navigable water. Wendy Park is not affected. New alignment may be required from one parcel with regulated materials concerns. Approximately 369 residents in 17 HUD buildings lie within 400 feet of the new alignment and thus may experience noise impacts. The new bridge passes within 50 feet of four HUD residential building housing approximately 43 residents. There are no adverse impacts to historic sites. The historic sites are shown with red dots on **Map F.2 in Appendix F**.

Structural

Alternative 36 is a high-level fixed bridge approximately 2,350 feet long. The bridge begins at Sta. 500+50 on State Street, west of the Shoreway ramp to West 28th Street. Access to the bridge is from the Shoreway ramp to 28th Street, then along Washington Avenue to the beginning of the Bridge at State Street.

The bridge begins along a tangent alignment, headed in a northerly direction, along and above the State Street R/W. The bridge rises at a 3 percent grade and crosses Old River at a height of approximately 114 feet above the design high water level of the channel and Lake Erie. This provides a clearance exceeding the required 100 feet.

After crossing the Old River, the bridge begins a decent at an 8 percent grade and begins a curve left. The curve radius is approximately 370 feet and the bridge turns through an angle of approximately 135 degrees.

The proposed bridge will be a steel plate girder bridge constructed on a reinforced concrete substructure in accordance with the latest AASHTO LRFD requirements. The minimum design live load will be HL-93.

As shown in **Table 5**, the preliminary layout indicates the bridge will be constructed in four (4) units.

Table 5. Alternative 36 Bridge Construction Units

Unit	Length (ft)
1	570
2	755
3	600
4	425

For the purpose of minimizing costs, the optimum span arrangement is often taken to be the spans at which the cost of the superstructure and the cost of the substructure are equal. For the standard plate girder bridge this usually happens when the spans are roughly twice the height of the piers. However, the total cost is relatively insensitive over a relatively large range (70 percent to 140 percent) from the optimum spans. Moreover, other factors beyond the lowest cost often dictate the final spans.

For this bridge spans were held under 300 feet (for straight spans) because such lengths can usually be economically constructed without haunch girders. Spans were kept as-long-as practical considering the high volume of truck traffic and constructability considerations of the curved portions of the bridge. Unit lengths were selected to allow manageable expansion lengths and appropriate end span ratios. A plate girder bridge was selected because it allows for a curved superstructure, relatively long spans and an easily replaceable deck. Post tensioned segmental construction is feasible, however at this length it would rarely be price competitive.

The 42-foot structure width was selected to allow future phase deck replacement while allowing stakeholder operations to continue during a phased replacement of the deck. The typical life of a deck now exceeds 50 years assuming deck overlays are provided after 30 years. T-Type piers are provided because of the relatively narrow superstructure and long spans. Also, given the height of the structure and the movements

of heavy trucks and equipment at this site, cap and column type piers would require large diameter columns and crash walls, and would be less economical than T-type piers.

Geotechnical

Subsurface conditions at the southern end of the alignment (where substructures will be located on the valley walls of the river) will consist of thick deposits of primarily sandy or silty soils (granular fill or beach deposits from ancestral Lake Erie), and bedrock will be 150+ below the ground surface. Depending on load demands, preliminary analysis indicates that relatively shorter friction piles (estimated to be in the neighborhood of 75 feet long) bearing within these beach deposits (could provide an adequate foundation system. Descending into the River Valley/Lake Plain, the stratigraphy will grade to the clayey lacustrine and till deposits described previously. While conventional driven piling is still the most appropriate foundation system, in these areas piling will need to be comprised of HP-sections and be driven to the hard glacial till deposit or to shale bedrock, to achieve sufficient capacity. Preliminary analysis suggests piles driven into the hard glacial till using HP14X73 (piers) or HP12X53 (abutments) will develop the required capacity. At most locations, the estimated pile length is approximately 85 feet. Piles driven into the till will derive their capacity as a combination of skin friction and tip resistance. It should be noted that the lacustrine clays (which will provide much of the skin friction resistance) are likely to undergo a very strong setup effect with respect to driven piles – we have measured end of initial drive capacities that are only 50% (or even less) of the ultimate capacity after setup. Setup typically takes a period of 2 to 4 weeks. As such, the construction schedule will need to accommodate restrike testing of piles, performed several weeks after initial pile driving.

Drilled shafts, while feasible, are not expected to be economical as the average drilled shaft length would approach 150 feet to bear on rock. Of course, during the final design process span arrangements and foundations will be revisited but we believe the arrangement chosen represents an economical and very constructible bridge type.

The surface fills and underlying lacustrine soils anticipated at the northern terminus of the bridge are soft, compressible materials. If significant grade changes will be required in this area, the potential for settlement of these strata and corresponding application of downdrag loads on the foundation piling, will be fairly high. Preloading programs, use of lightweight fills, or use of wick drains to accelerate consolidation may be necessary.

Maintenance of Traffic

A new fixed bridge could be constructed at this location while the existing lift bridge remains in service.

Utilities

The portion of the proposed bridge over River Road will require the relocation of one electric utility pole that supports five separate overhead electric lines. Over Cargill's property, three electric utility poles and three overhead electric lines will need to be relocated.

Other

As shown on the plans in **Appendix B**, a 5% grade on the south side of the bridge and an 8% grade on the north is required to provide the 100' of vertical clearance over the Old River. A share-use path is provided leading up to and along the bridge to provide bike and pedestrian connectivity. According to ODOT's Location and Design Manual, Volume 1, Section 308.2, the basic geometric design guidelines for motor vehicles will result in a facility that will provide a safe accommodation for on-street bicyclists. If properly designed for motor vehicles, roadway design elements such as stopping sight distance, horizontal and vertical alignment, grades, and cross slopes will meet or exceed the minimum design standards applicable to bicyclists. Cooperation from NS may allow for improvement in the alignment and profile.

8. MCDA Ranking of Alternatives

8.1 MCDA Ranking Process

AECOM subject matter experts assessed the performance of each of the four alternatives under consideration on each of the measures, as shown on in **Table D.2 (Appendix D).**

Elicitation of Values and Preferences

Utility Functions

MCDA Consulting posed a series of questions to AECOM team leaders to uncover how the Decision Maker's satisfaction would vary as each measure varied from their least desirable to their most desirable levels. Their answers resulted in utility functions (typically interpreted as preference functions) for the 21 measures listed on **Table D.2 (Appendix D).** Notice how the satisfaction of the decision maker is not always a linear function of the levels of a measure. Utility functions for qualitative measures are represented by satisfaction histograms. For reference, the utility functions are shown in **Appendix D**.

Weights

The relative importance of each measure (their weight) was obtained by asking AECOM team leaders a series of trade-off questions. This approach brings to the forefront choices that inevitably need to be made, requiring consideration of what decision makers are willing to give up in one measure in order to gain on another. This results in weights that better reflect the true preferences of the Decision Maker than direct assignment of weights to each measure or criterion.

Trade-off questions were formulated using two measures at a time (A and B). For each pair of measures, MCDA Consulting asked AECOM to compare two hypothetical project alternatives, one as good as possible on measure A and as bad as possible on measure B, and the other as bad as possible on measure A and as good as possible on measure B. These hypothetical alternatives were identical in all other measures. AECOM, representing the Decision Maker, was encouraged to think hard about how much to give up of a certain measure to gain on another.

The process was repeated until all trade-offs between criteria were established.

An example of this process is shown next:

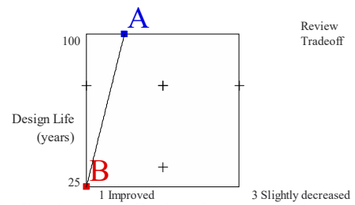
Question: Assume two hypothetical alternatives to the Willow Lift Bridge project, A and B. They are identical in all evaluation measures, except for Design Life and Conflict Points/Truck Traffic. Alternative A has slightly decreased rating on Conflict Points/Truck Traffic (the least desirable level) and a Design Life of 100 years (the most desirable level). Alternative B has an improved rating on Conflict Points/Truck Traffic, but a Design Life of only 25 years (the least desirable level). Do you prefer A, B, or are you indifferent between these two hypothetical alternatives?

Answer: We prefer B.

Question: At what level would A need to be on Conflict Points/Truck Traffic for you to be indifferent between the two?

Answer: About 1.5 (between improved and unchanged).

These answers result on a ratio of 3.33 to 1 between the weights of conflict points and design life. The process is illustrated in **Figure 2**, and the decision maker should be indifferent between any (hypothetical) alternative that falls on the line linking A to B.



	A	B	A-B
Conflict points, Truck traffic (change from current conditions):	1.5	1	0.5
Design Life (years):	100	25	75

Conflict points, Truck traffic Measure Weight:Design Life Measure Weight = 3.33333:1

Figure 2. Trade-off Between Design Life and Conflict Points/Truck Traffic

There is a strong relationship between measure ranges and weights. Any measure on which all four alternatives had identical ratings should have a weight of zero (see for example Air Quality – all alternatives rated unchanged - and Vehicular Access – all alternatives rated neutral). In addition, if the actual range of ratings for a measure was narrower than the range (least to most desirable level) initially entered into the model, its weight should decrease. Weights were therefore adjusted based on the actual ratings of the alternatives and Effective Weights calculated as shown on **Table 6**.

Table 6. Percentage Weights - Assessed and Effective

Measure	Percentage Weight	Effective Weight
Conflict Points, Truck Traffic	37.47	39.0257
Environmental Justice	14.77	6.7702
Economic Development	14.75	15.3657
Design Life	14.73	13.6404
Operations and Efficiency	8.96	12.4491
Access to S. Whiskey Isl	7.06	9.8040
Improvement Implementation	1.47	2.0418
Regulated Materials	0.21	0.2826
Aesthetics	0.18	0.2451
Project Cost	0.10	0.1184
Site Security	0.08	0.0536
Noise	0.08	0.0523
Long Term O&M Cost	0.06	0.0522
Vehicular and Maritime	0.06	0.0824
Roadway Geometry	0.01	0.0102
Bridge Design	0.00	0.0025
Geotechnical Design	0.00	0.0038

8.2 Results of MCDA Ranking

Based on preferences expressed by AECOM team leaders, representing the project Decision Makers, and the ratings of the 4 alternatives considered on the selected criteria and measures, the State Street Bridge is the alternative with the highest utility (preferred alternative). The ranking of alternatives is as shown in **Figure**

3. The bars represent the overall utility (satisfaction of the decision maker, or desirability) of each alternative, with colors representing the contribution of each of the 10 criteria to the overall utility.

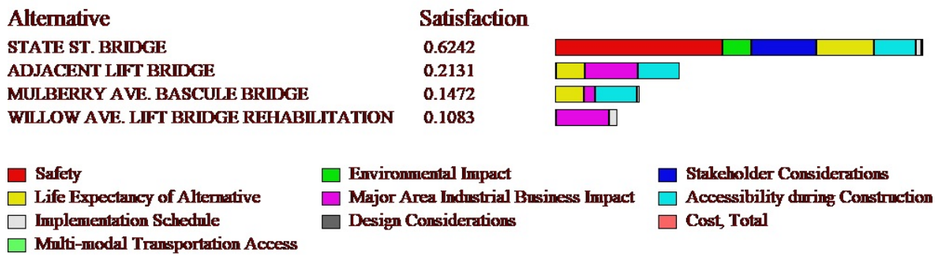


Figure 3. Ranking of Alternatives

Notice that the criterion that most impacts the ranking is Multi Modal Transportation Access – the degree to which the alternative provides access to South Whiskey Island to all modes of transportation.

A comparison between the first and second rated alternatives – Mulberry Road Bascule Bridge and Rehabilitation of the existing Willow Road Bridge - is shown in graphical and tabular form in **Figure 4**. It goes into more detail than the previous figure and presents not the criteria, but the 10 measures on which the difference between alternatives is most significant.

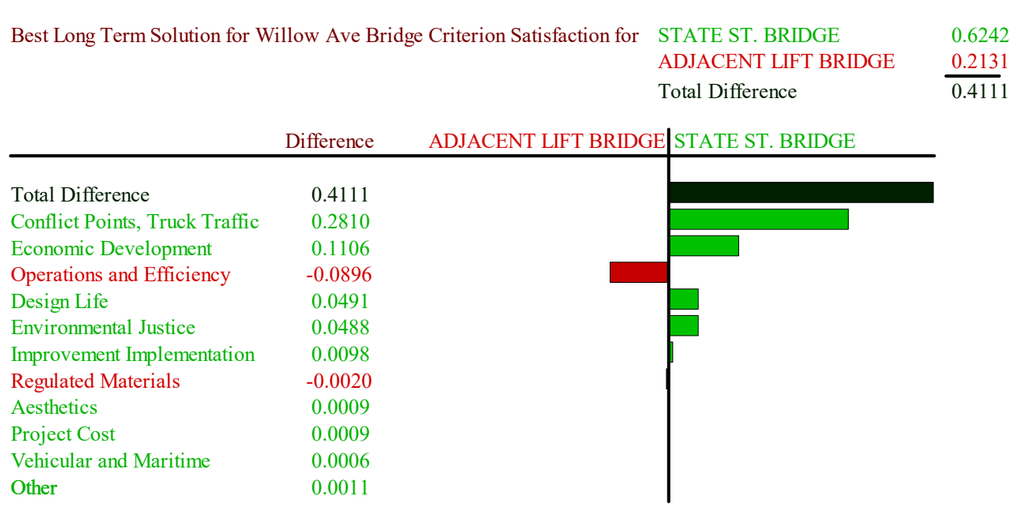


Figure 4. Comparison Between Top Ranked and Second Ranked Alternatives

Table 7. Comparison Between Top Ranked and Second Ranked Alternatives
(Ten measures most relevant to the difference are shown)

Measure	State Street Bridge (Top Ranked)	Adjacent Lift Bridge (Second Ranked)	% Contribution to Difference	Total Contribution
Conflict Points, Truck Traffic	Slightly improved	Unchanged	68.4	0.2810
Economic Development	Medium	Low	26.9	0.1106
Operations and Efficiency	decreased, decreased, decreased	unchanged, unchanged, unchanged	-21.8	-0.0896
Design Life	75	50	11.9	0.0491
Environmental Justice	Medium	High	11.9	0.0488
Improvement Implementation	Medium	Very High	2.4	0.0098
Regulated Materials	2	0	-0.5	-0.0020
Aesthetics	High	Medium	0.2	0.0009
Project Cost	51.88	166.88	0.2	0.0009
Vehicular and Maritime	Low	High	0.1	0.0006

9. Project Financing and Alternative Delivery Options

9.1 Funding Gap Summary

Cargill, Ontario Stone and CSI are the primary current beneficiaries of the Project. They pay income and property taxes into the City's coffers. Given that the companies are paying municipal income tax public funding support and continuous provision of the access road to the island is warranted.

The public and private funding and financing sources reviewed in this chapter may provide funds for the needed capital improvements. However, these funds are spread over many eligible projects and/ or prioritized towards projects with the most needs. Any single funding or financial source is unlikely to have a capacity to be a single source of the Project. Error! Reference source not found. **Table 8** describes the multiple sources of funding or borrowing by Project alternative. Since the Ohio Law, as defined Ohio Revised Code Section 5531.18 is restrictive of the City's authority to impose tolls on trucks crossing the bridge, the project does not fit any of the toll project definitions as specified in Section 5531.18.

The Total Capital Costs shown in **Table 8** are total project costs and include construction, construction engineering, preliminary engineering, R/W acquisition, and operation and maintenance in 2019 dollars (i.e. the cost estimates do not include inflation). See **Appendix L** for a cost breakdown.

Alternative 15 costs between 3.13 and 3.22 more than alternatives 4,16, and 36. Identifying funding sources for Alternative 15 to fully cover the Project cost is challenging. **Table 8** estimates a funding gap of $46.1 million for Alternative 15. The Project will need an array of funding sources to be fully funded; and the likelihood of receiving the funding is contingent on the local contribution.

This funding analysis is based on findings as of December of 2019.

Table 8. Alternative Capital Funding Targets (2019$)

Alternative	4	15	16	36
Total Capital Cost	$45,036,143	$141,659,843	$45,196,161	$44,038,556
Annual O&M Cost	**$300,000**	**$300,000**	**$300,000**	**$30,000**
Sources				
Federal Contributions				
Formula Funding*				
Local Major Bridge Program	$8,386,143	$20,000,000	$8,546,161	$14,888,556
Municipal Bridge Program				
Ohio's Bridge Partnership Program				
Discretionary Funding				
INFRA Grant**	$25,000,000	$50,000,000	$25,000,000	$17,500,000
BUILD Grant**	$-	$-	$-	$-
Public Works Grant	$1,400,000	$1,400,000	$1,400,000	$1,400,000
EAA Grant	$650,000	$650,000	$650,000	$650,000
State Contributions				
SCIP Program	$2,000,000	$9,928,000	$2,000,000	$2,000,000
LTIP Program	$1,000,000	$7,000,000	$1,000,000	$1,000,000
Ohio SIB Financing	$5,000,000	$5,000,000	$5,000,000	$5,000,000
O&M Cost Savings	$-	$-	$-	$-
Local Contributions				
City of Cleveland	$1,000,000	$1,000,000	$1,000,000	$1,000,000
Private Sector Contributions				
TID Revenue Yield (at 10 %)	$600,000	$600,000	$600,000	$600,000
Total Federal Contributions***	$35,436,143	$72,050,000	$35,596,161	$34,438,556
%	79%	51%	79%	78%
Total State Contributions	$8,000,000	$21,928,000	$8,000,000	$8,000,000
%	18%	15%	18%	18%
Total Local Contributions	$1,000,000	$1,000,000	$1,000,000	$1,000,000
%	2%	1%	2%	2%
Total Private Sector Contributions	$600,000	$600,000	$600,000	$600,000
%	1%	0%	1%	1%
Overall Contributions	$45,036,143	$95,578,000	$45,196,161	$44,038,556
Potential Funding Gap	**$-**	**$(46,081,843)**	**$-**	**$-**

Source: AECOM

Notes: Shared cells represent maximum possible funding.

** Federal funds allocated by ODOT. The project can be awarded a Municipal Bridge Program grant or an Ohio's Bridge Partnership Program grant, not a combination of both. Also, the likelihood of funding from the Local Major Bridge Program and the Municipal Bridge Program is low.*

*** The project can be awarded an INFRA grant or a BUILD grant, not a combination of both. INFRA was selected for this table since INFRA grant awards tend to be larger than BUILD grants awards.*

**** Toll revenue credits could be applied to federal aid transportation projects to increase the federal payable share.*

The following section describes the potential funding and financing sources for the Project and their applicability. The available funding and financing sources explored below are summarized in **Table 9**.

Table 9. Available Funding Sources Options Summary

Funding	Type		Program Name	Applicable
Federal	Grants	Formula	National Highway Performance Program	√
			Surface Transportation Block Grant Program	√
			Congestion Mitigation and Air Quality Improvement Program	√
			National Highway Freight Program	√
			Local Major Bridge Program	√
			Municipal Bridge Program	√
			Ohio's Bridge Partnership Program	√
		Discretionary	Infrastructure For Rebuilding America Program	√
			Better Utilizing Investments to Leverage Development Program	√
			Public Works Program	√
			Economic Adjustment Assistance Program	√
	Loans, Loan Guarantees, and Lines of Credit		TIFIA	*X*
	Federal-aid Matching Strategy		Toll Revenue Credits	√
State	Grants, Loans, and Loan Assistance or Local Debt Support		State Capital Improvement Program	√
			Local Transportation Improvement Program	√
	Loans		Ohio State Infrastructure Bank Loan Program	√
Local	Loans		Cuyahoga County Property and Sales Taxes Bonds	√
	Loans		City of Cleveland Income and Property Taxes Bonds	√
Private	Loans		Tolling	*X*
	Loans		Transportation Improvement District	√
	Loans		Business Improvement District	*X*
	In-kind contribution			√

Source: AECOM

The potential use of funding through the Maritime Assistance Program (MAP) was analyzed but omitted for this Project, as eligibility requirements indicated that the applicant must be a port authority in the State. [1]

9.2 Federal Funding

The Fixing America's Surface Transportation (FAST) Act was signed into law on December 4, 2015 by President Obama. It authorized $305 billion for fiscal years 2016 to 2020 for highway, safety, public transportation, motor carrier safety, hazardous materials safety, rail, research, technology, and statistics programs. The FAST Act provided the first dedicated source of federal funding for freight projects.[2]

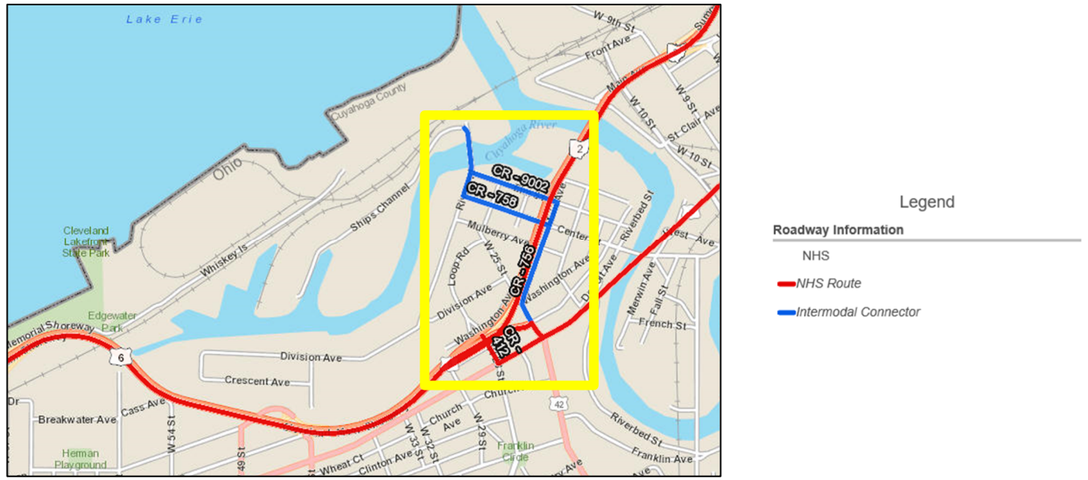
Federal funding for transportation is derived in part from highway excise taxes (i.e. taxes paid when purchases are made on a specific good) on motor fuel and truck-related taxes on truck tires, sales of trucks and trailers, and heavy vehicle use. Excise taxes on gasoline and other motor fuels account for more than 85 percent of all receipts to the federal Highway Trust Fund (HTF). Tax revenues are deposited into either the Highway Account or the Mass Transit Account of the federal HTF and then distributed to the states. The Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) then distribute funds from the Highway and the Mass Transit Accounts, respectively, to each state through a system of formula grants and discretionary allocations. The FAST Act extended the imposition of highway-user taxes through September 30, 2022, with generally no change to the tax rates as imposed under the Moving Ahead for Progress in the 21st Century Act (MAP-21).

According to estimates from the Congressional Budget Office (CBO),[3] since 2001 outlays have consistently exceeded the revenues to the trust fund. To address the shortfall, Congress has authorized transfers from the CBO general fund to the HTF to prevent the HTF from being depleted. Under the FAST Act, $52 billion was transferred to the HTF Account and $18 billion to the Mass Transit Account, allowing the accounts to pay their obligations through the end of fiscal year 2020.

Eligibility for Federal Funding

The Project, classified as an "Intermodal Connector" by the Ohio Department of Transportation (ODOT), is part of the National Highway System (NHS) which makes it eligible for federal funds.[4] (refer to **Figure 5**) Guided by the FHWA criteria, the state DOTs in partnership with the local MPO's designate intermodal connectors to the NHS based on the annual freight volume or daily vehicular traffic on one or more principal routes that serve intermodal facilities. The primary criterion for adding intermodal connectors to the NHS for truck/rail projects is 50,000 TEUs (i.e. 20-foot equivalent units) per year or 100 trucks per day in each direction on the principal connecting route. The secondary criterion for the state DOTs to designate the intermodal connector to the NHS are related to the importance of an intermodal facility within the state. Selected intermodal terminals should handle more than 20 percent of freight volumes by mode within a State. [5]

[1] ODOT Ohio Maritime Assistance Program (MAP) Request for Applications, June 30, 2020, https://transportation.ohio.gov/static/Programs/StatewidePlanning/Maritime/MAP%20Final%20Request%20For%20Application%20(RFA)%20solicitation%20June%202020.pdf
[2] The FAST Act, https://www.fhwa.dot.gov/fastact/
[3] Congressional Budget Office, Limit Highway and Transit Funding to Expected Revenues, December 13, 2018, https://www.cbo.gov/budget-options/2018/54774
[4] ODOT (2016). National Highway System in Cuyahoga County, http://www.dot.state.oh.us/Divisions/Planning/ProgramManagement/MajorPrograms/MapRoom/Cuyahoga%20NHS.pdf
[5] Freight Intermodal Connectors Study, FHWA, 2017, https://ops.fhwa.dot.gov/publications/fhwahop16057/fhwahop16057.pdf



Source: ODOT Transportation Information Mapping System (TIMS)

Figure 5. National Highway System in Cuyahoga County

Federal Formula Funding

Under the FAST Act, apportioned funding is allocated by ODOT for the following programs (before post-apportionment set asides, penalties, and sequestration):

National Highway Performance Program (NHPP): The NHPP provides support for the condition and performance of the National Highway System (NHS), construction of new facilities on the NHS, and ensuring that investments achieve performance targets established by state asset management plans. Funds are apportioned based on formulas to each state, and states divide it among apportioned programs. Eligible activities include reconstruction, resurfacing, restoration, rehabilitation, and preservation of bridges on non-NHS highways, projects that reduce the risk of failure of NHS infrastructure, and subsidies for projects under the Transportation Infrastructure Finance and Innovation Act (TIFIA).[6] Ohio's estimated apportionment for fiscal years 2016 to 2020 is $3.9 billion.[7]

Surface Transportation Block Grant Program: The program provides flexible spending to states based on apportionment formulas for state and local transportation needs. Eligible projects include the construction of highways, bridges, tunnels, transit capital projects, operational improvements, safety infrastructure projects, parking facilities, recreational trails, bicycle and pedestrian projects, planning and design of roadways and interstates, surface transportation planning, travel demand management strategies, congestion pricing, and numerous others as found in 23 U.S.C. 133(b)(15).[8] Ohio's estimated apportionment for fiscal years 2016 to 2020 is $2.0 billion.

Congestion Mitigation and Air Quality Improvement Program (CMAQ): The CMAQ program provides flexible funding to state and local governments for transportation projects that help meet the requirements of the Clean Air Act (1992). Funds are available for projects that reduce congestion and improve air quality in non-attainment areas. Funds are apportioned to states to divide among localities. Eligible activities include projects or programs that contribute to the attainment or maintenance of a national ambient air quality standard, has a high level of effectiveness in reducing air pollution, and is included in the Metropolitan Planning Organization's (MPO) Transportation Improvement Program (TIP).[9] If the Project reduces emissions and help improve air quality by eliminating partially loaded trucks on the road due to the bridge condition, the Project could apply to CMAQ funds. Ohio's estimated apportionment for fiscal years 2016 to 2020 is $496.7 million.

National Highway Freight Program: The program aims to improve the efficient movement of freight on the National Highway Freight Network (NHFN). A lump sum is apportioned by state and then divided among programs at the local level. Eligible activities include projects and programs that contribute to the efficient movement of freight as identified in the state's freight plan. Examples may include ramp metering, truck-only lanes, adding or widening of shoulders, adding road capacity to address highway freight bottlenecks, separation of passenger vehicles and commercial vehicles, and numerous other projects.[10] Ohio's estimated apportionment for fiscal years 2016 to 2020 is $213.8 million.
Also, ODOT administers federal formula funds through its work program, which includes three special funding options for Ohio bridges: the **Local Major Bridge Program,** the **Municipal Bridge Program** and the **Ohio's Bridge Partnership Program**.[11]

The Project will need to be included in the NOACA 2040 Long Range Transportation Plan (LRTP) and MPO's Transportation Infrastructure Plan (TIP) to be eligible for the federal funding mentioned above.[12]

The main funding option applicable to the Project is ODOT's administered Local Major Bridge Program described below. Additionally, the Municipal Bridge Program provides funding (of up to $2 million per project) for municipal corporations and transit agencies and the Ohio's Bridge Partnership Program provides funding (of up to $1 million per project) for counties and municipalities. Funding awarded through the Municipal Bridge Program and the Ohio's Bridge Partnership Program may not be used in conjunction.

Local Major Bridge Program

The Local Major Bridge Program provides federal funds to counties and municipalities for bridge replacement or major bridge rehabilitation projects. The program is administered by ODOT's Division of Planning, Office of Local Programs.[13]
The annual allocation for the Local Major Bridge Program is established by ODOT. There is a maximum of $20,000,000 per project within the available funding. ODOT provides up to 80 percent of eligible construction costs (including construction engineering, i.e. testing and inspection). The local agency is responsible for the 20 percent non-federal share of the construction costs and for all costs associated with preliminary engineering, environmental studies and documents, final design and right of way. The local contribution for construction is required to be in cash. In-kind contributions cannot be accepted as part of the local share. ODOT makes 15 percent Toll Revenue Credit (TRC) available to increase the Federal percentage from 80 percent to 95 percent as long as TRC is available.
To be eligible for funds, projects must have a General Appraisal of four or less, or be legally posted for load restriction. Those bridges that are not structurally deficient but are functionally obsolete may be considered on a case by case basis. The proposed project must be publicly-owned and on existing publicly-owned property.
The project solicitation process begins September 1 of each year. The applicant needs to complete an application for funds and submit it to the Local Major Bridge Program Manager by October 1 of each calendar year. Projects must also have a completed feasibility study and are required to submit it with the project application.

[6] National Highway Performance Program, https://www.fhwa.dot.gov/fastact/factsheets/nhppfs.cfm
[7] Estimated Highway Apportionments under the FAST Act, https://www.fhwa.dot.gov/fastact/estfy20162020apports.xlsx
[8] Surface Transportation Block Grant Program, https://www.fhwa.dot.gov/fastact/factsheets/stbgfs.cfm
[9] Congestion Mitigation and Air Quality Improvement Program, https://www.fhwa.dot.gov/fastact/factsheets/cmaqfs.cfm
[10] National Highway Freight Program, https://www.fhwa.dot.gov/fastact/factsheets/nhfpfs.cfm
[11] ODOT. Program Resource Guide, Fiscal Year 2020 Program. http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/Documents/ProgramResourceGuide.pdf
[12] Northeast Ohio Areawide Coordinating Agency 2040 Long Range Transportation Plan for Northeast Ohio: http://www.noaca.org/
[13] ODOT. Local Major Bridge Program Description. http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/Local_Funding_Opportunities_Pages/LocalMajorBridge.html

ODOT 2020 Program Resource Guide summarizes local major bridge eligibility criteria as follows:[14]

- Bridge must have County or City maintenance responsibility
- Bridge must be structurally deficient
- Bridge must be open and carry vehicular traffic
- Bridge must have a General Appraisal of 4 or less or legal posted for load restriction
- Bridge is not funded by Local Bridge (LBR) Program, Ohio Public Works Program, or the County Capital Program(s)
- Must meet the Federal bridge definition (span greater than 20 feet)
- Bridge must be 35,000 square feet or greater in deck area and/or be a moveable/lift structure
- Individual 404/401 waterway permit not required
- Must have completed a feasibility study

ODOT further scores eligible projects in order to prioritize limited funding amongst the existing needs throughout the state. ODOT applies five key criteria to score each project. The criteria for 2019 Program Year are summarized in **Table 10** and could be updated or changed in the future program years. **Table 11** defines each criteria specifically.

Table 10. ODOT Local Major Bridge Program Scoring Criteria

	Category	Maximum Points	Weight Factor	Total Points
1	General Appraisal	10	3.5	35
2	Local Share			
	Dollar Amount	10	1.0	10
	Percent	10	1.0	10
3	Economic Health	10	1.5	15
4	Regional Impact	10	3.0	30
	Total Maximum Score =			100

Source: ODOT Local Major Bridge Program. August 2019.
http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/Local%20Major%20Bridge%20Documents/Local%20Major%20Bridge%20Program%20Guidelines.pdf

Table 11. Local Major Bridge Program Scoring Criteria Definition

	Category	Definition	Source of Data for Rating	Scoring
1	General Appraisal	Rated from 0 to 9, with rating of 5 or more being acceptable	The General Appraisal values are kept in the bridge inventory database maintained by ODOT	1-2 = 10 points 3 = 8 points 4 = 6 points 5-9 = 0 points
2	Local Share	Measure of bridge owner's willingness and ability to obtain funding for the local match or 20	The applicant agency	
	Dollar Amount			>15M = 10 points 10<15M = 8 points 7<10M = 6 points 3<7M = 4 points 1<3M = 2 points <1M = 0 points
	Percent			>50% = 10 points 40<50% = 8 points 30<40% = 5 points 20<30% = 2 points <20% = 0 points
3	Economic Health	Unemployment rate as share of Statewide Rate	Ohio Department of Development	>=2.1% = 10 points 1.6%-2.0% = 8 points 1.1%-1.5% = 6 points 0.6%-1.0% = 4 points 0.1%-0.5% = 2 points =< state average = 0 points
4	Regional Impact	Bridge significance to the area: Average Daily Traffic (ADT)		>40,000 = 5 points >30,000 - 40,000 = 4 points >20,000 - 30,000 = 3 points >10,000 - 20,000 = 2 points <=10,000 = 0 points
		Functional Class		Principal Arterial = 5 points Minor Arterial = 3 points Collector = 2 points Local = 1 point
	Total Maximum Score =			100

Source: ODOT Local Major Bridge Program. August 2019.

The Willow Avenue Lift Bridge was included in the Local Major Bridge program for $2.6 million grant in 2017. The bridge is functionally obsolete but not structurally deficient with the current General Appraisal rating of 5. The bridge was posted for load-carrying restriction and recently inspected (last inspection occurred in 7/22/2019).[15] The City owns and maintains the bridge.
With a General Appraisal score of 5 and low regional impact score (the bridge ADT is less than 10,000 and its functional class is "Local" giving it only 1 point) the bridge may have difficulties competing with other projects for funding. Once the bridge is re-appraised to 4 in the General Appraisal score, and the City has identified a 20 percent local match for federal funding, the project may score higher.

Municipal Bridge Program

The program provides federal funds for bridge replacement or bridge rehabilitation projects to municipal corporations and transit authorities up to a limit of $2 million per project. Bridges must be open to vehicular traffic. ODOT will provide up to 80 percent of the eligible costs for construction and construction inspection only. Historically, the funding amount for this program has been approximately $10 million annually.
Municipal Bridge Program funds may be used for the following:

- Bridge replacement
- Bridge rehabilitation
- Bridge demolition

[14] ODOT Program Resource Guide, 2020, page 14
http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/Documents/ProgramResourceGuide.pdf

[15] ODOT, Eligible Projects for the Local Major Bridge Program. Bridge Number 1869981
http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/Local%20Major%20Bridge%20Documents/Local%20Major%20Bridges.pdf

- Minimal approach work: as necessary and related to the bridge project
- Utilities: if the utility lines are on the bridge and it is necessary to the project to move or replace

ODOT applies five key criteria to score each project. The criteria are summarized in **Table 12** and **Table 13**.

Table 12. ODOT Municipal Bridge Program Scoring Criteria

	Category	Maximum Points	Weight Factor	Total Points
1	General Appraisal	10	3.5	35
2	Deck Summary	10	1.5	15
3	Bridge Load Limit	10	1.5	15
4	Economic Health	10	1.0	10
5	Regional Impact	10	2.5	25
	Total Maximum Score =			100

Source: ODOT Municipal Bridge Program. August 2019.
http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/Municipal%20Bridge%20Program%20Documents/Municipal%20Bridge%20Program%20Guidelines.pdf

Table 13. Municipal Bridge Program Scoring Criteria Definition

	Category	Definition	Source of Data for Rating	Scoring
1	General Appraisal	Rated from 0 to 9, with rating of 5 or more being acceptable	The General Appraisal values are kept in the bridge inventory database maintained by ODOT	1-2 = 10 points 3 = 9 points 4 = 8 points 5-9 = 0 points
2	Deck Summary	Rated from 0 to 9, with rating of 5 or more being acceptable condition	The Deck Summary values are kept in the bridge inventory database maintained by ODOT	1-2 = 10 points 3 = 8 points 4 = 6 points 5 = 2 points 6-9 = 0 points
3	Bridge Load Limit	It is based on the current condition of the bridge and the carrying capacity of vehicular traffic		<12.5% = 10 points 25-12.4% = 8 points 37.5-24.9% = 6 points 50-37.4% = 4 points >50% = 0 points
4	Economic Health	Unemployment rate as share of statewide rate	Ohio Department of Development	>=2.1% = 10 points 1.6%-2.0% = 8 points 1.1%-1.5% = 6 points 0.6%-1.0% = 4 points 0.1%-0.5% = 2 points =< state average = 0 points
5	Regional Impact	Bridge significance to the area: Average Daily Traffic (ADT)		>30,000 = 10 points >20,000 – 29,999 = 8 points >10,000 – 19,999 = 6 points >5,000 – 9,999 = 4 points >2,000 – 4,999 = 2 points
	Category	Definition	Source of Data for Rating	Scoring
				<=1,999 = 0 points
	Total Maximum Score =			100

Source: ODOT Municipal Bridge Program. August 2019.

Currently, there are about 1,300 bridges statewide that have a Municipal owner and meet the federal definition of a bridge (greater than 20 feet). The Willow Street Bridge is included in the target bridge list of 2019.[16] The likelihood of receiving funding form both the Local Major Bridge Program and from the Municipal Bridge Program is low.

Ohio's Bridge Partnership Program

The Ohio Bridge Partnership Program (OBPP) provides Federal funds to counties and municipalities for roadway bridge replacement projects utilizing either the typical design-bid build or design-build methods. A funding limit of $1 million per project has been established.[17]
ODOT will provide 100 percent of eligible costs for construction only (including construction engineering, i.e. testing and inspection), up to the specified funding limit. The local entity is responsible for all costs associated with preliminary engineering, environmental studies and documents, final design and right of way.
OBPP funds may be used for the following:

- Bridge replacement
- Minimal approach work: as necessary and related to the bridge project (general rule of thumb is 50' on each side)
- Utility work necessary to complete the project: if the utility lines are on the bridge and it is necessary to the project to move or replace (will not pay for "upgrades" to the current system; e.g. a 30" pipe rather than the existing 24")

ODOT applies six key criteria to score each project. The criteria are summarized in **Table 14** and **Table 15**.

Table 14. ODOT Ohio's Bridge Partnership Program Scoring Criteria

	Category	Maximum Points	Weight Factor	Total Points
1	General Appraisal	10	2.5	25
2	Deck Summary	10	1.5	15
3	Bridge Load Limit	10	1.0	10
4	Economic Health	10	1.0	10
5	Regional Impact	15	1.0	15
6	Additional Factors	10	2.5	25
	Total Maximum Score =			100

Source: ODOT Ohio's Bridge Partnership. August 2019. http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/OBPP/OBPP_Guidance.pdf

[16] ODOT, 2019 Target Municipal Bridge List. Bridge Number 1869981
http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/Municipal%20Bridge%20Program%20Documents/2019%20Target%20Municipal%20Bridge%20List.pdf

[17] ODOT, Ohio Bridge Partnership Program Description. http://www.dot.state.oh.us/Divisions/Planning/LocalPrograms/OBPP/OBPP_Guidance.pdf

Table 15. Municipal Ohio's Bridge Partnership Program Scoring Criteria Definition

	Category	Definition	Source of Data for Rating	Scoring
1	General Appraisal	Rated from 0 to 9, with rating of 5 or more being acceptable	The General Appraisal values are kept in the bridge inventory database maintained by ODOT	1-2 = 10 points 3 = 9 points 4 = 8 points 5-9 = 0 points
2	Deck Summary	Rated from 0 to 9, with rating of 5 or more being acceptable condition	The Deck Summary values are kept in the bridge inventory database maintained by ODOT	1-2 = 10 points 3 = 8 points 4 = 6 points 5 = 2 points 6-9 = 0 points
3	Bridge Load Limit	It is based on the lowest legal load rating factor		<0.40 = 10 points 0.499 – 0.40 = 9 points 0.599 – 0.50= 8 points 0.699 – 0.60 = 7 points 0.799 – 0.70 = 6 points 0.899 – 0.80 = 5 points 0.999 – 0.90 = 4 points >1.0 = 0 points
4	Economic Health	Unemployment rate as share of statewide rate	Ohio Department of Development	>=2.1% = 10 points 1.6%-2.0% = 8 points 1.1%-1.5% = 6 points 0.6%-1.0% = 4 points 0.1%-0.5% = 2 points =< state average = 0 points
5	Regional Impact	Bridge significance to the area: Average Daily Traffic (ADT)		>350 = 10 points >300 – 349 = 9 points >275 – 299 = 8 points >250 – 274 = 7 points …
		Length of the proposed detour during construction		>10 = 5 8.1 – 10 = 4 6.1 – 8 = 3 4.1 – 6 = 2 2.1 – 4 = 1 <=2 =0
6	Additional Factors	Variable factors		
	Total Maximum Score =			100

Source: ODOT Ohio's Bridge Partnership. August 2019.

Federal Discretionary Funding

The project could benefit from the following federal discretionary funding sources: the Infrastructure For Rebuilding America (INFRA) program, the Better Utilizing Investments to Leverage Development (BUILD) program, the Public Works Program and Economic Adjustment Assistance (EAA) Program. Other discretionary funding sources that the Project could explore are the Outdoor Recreation Facility Grants offered by the Ohio Department of Natural Resources to local governments to increase recreational opportunities. Maximum awards range between $150,000 and $500,000.[18]
Unlike federal formula funds which are allocated on an annual basis amongst the states to maintain and capitalize the existing infrastructure, discretionary funds are one-time allocations based on a competition between projects nation-wide with projected evaluated based on the discretionary program's specific goals.

INFRA Program

Established under the FAST Act, the INFRA program aims to fund nationally and regionally significant freight projects. The INFRA program gives priority to projects that support four key objectives:

- Supporting economic vitality at the national and regional level;
- Leveraging federal funding to attract other, non-Federal sources of infrastructure investment, as well as accounting for the life-cycle costs of the project;
- Using innovative approaches to improve safety and expedite project delivery;
- Holding grant recipients accountable for their performance and achieving specific measurable outcomes identified by grant applicants.

The federal share of the project may not exceed 80 percent, with 60 percent maximum of INFRA grant funds. Eligible projects include highway freight projects on the NHFN, highway or bridge projects that add capacity to an interstate or a national scenic area, and freight projects including intermodal, rail, or port projects, and grade separation projects. Projects are evaluated based on selection criteria including the results of a benefit-cost analysis (BCA) and an application narrative. The Secretary of USDOT ultimately makes the final award recommendations. The most recent round of INFRA (FY 2019) was authorized up to $950 million, with $1 billion authorized for FY 2020.[19] FY 2019 INFRA applications were due in March 2019 and awards announced in July 2019. The average award was $42.8 million, with a maximum award of $125 million and a minimum award of $5 million. FY 2020 INFRA applications are due on February 25.

BUILD Program

The Consolidated Appropriations Act, 2019 appropriated $900 million to be awarded by the USDOT for National Infrastructure Investments. This appropriation stems from the program funded and implemented pursuant to the American Recovery and Reinvestment Act of 2009 and is known as the BUILD program. It was previously known as TIGER. Funds for the fiscal year 2019 BUILD Transportation grants program are to be awarded on a competitive basis for surface transportation infrastructure projects that will have a significant local or regional impact.
Under the most recent round of submissions, projects seeking funding must have met eligibility requirements. Latest applications were due July 15, 2019 and awarded November 12, 2019. Projects are awarded based on the application package, review by USDOT, and ultimately the Secretary of USDOT's recommendation. Projects that show strong partnerships among stakeholders, both public and private, are better posed to win. In addition, projects must submit a BCA that demonstrates the project has greater benefits than it costs to construct and operate, i.e. a benefit cost ratio of greater than 1.0. The average 2019 BUILD program award was $16.1 million, with a maximum award of $25 million and a minimum award of $2.4 million.

Public Works and Economic Adjustment Assistance Program

These grant programs administered through the Economic Development Authority (EDA), a bureau within the Department of Commerce, provides investments that support construction, non-construction, technical assistance, and revolving loan fund projects on a competitive merit basis. Eligible applicants must be public or private non-profit organizations acting in cooperation with officials of a political subdivision of a state. Generally, the amount of an EDA award may not exceed 50 percent of the total cost of the project. Projects may receive an additional amount that may not exceed up to 30 percent of the total project cost, based on the relative needs of the region in which the project will be located, as determined by EDA.

[18] Ohio Department of Natural Resources Office of Real State & Land Management. http://realestate.ohiodnr.gov/outdoor-recreation-facility-grants

[19] Infrastructure for Rebuilding America (INFRA) factsheet, https://www.fhwa.dot.gov/fastact/factsheets/infragrantsfs.cfm

Projects must demonstrate economic distress under one or more of the following criteria: (i) an unemployment rate that is, for the most recent 24-month period for which data are available, at least one percentage point greater than the national average unemployment rate; (ii) per capita income that is, for the most recent period for which data are available, 80 percent or less of the national average per capita income; or (iii) a “Special Need,” as determined by EDA.[20]
Based on Census data for 2017, the City qualifies as economically distressed based on criteria (i) with an unemployment rate of 7.4 percent which is 3.3 points higher then the national unemployment rate (4.1 percent), and criteria (ii) with an average per capita income of $18,844 compared to the national $31,177 resulting in a regional per capita income that is 60.4 percent of the national.
The average size of a Public Works program investment is $1.4 million and funds 80-150 projects per year. The average award for the EAA program is $650,000 and funds 70-140 projects per year. Implementation projects can expect funding of up to $2 million. Eligible projects may apply on an ongoing basis as there is no deadline for the current Notice of Funding Opportunity (NOFO).[21]

9.3 Federal Financing

The TIFIA provides federal credit assistance to eligible highway, transit, intercity rail, and some freight rail, intermodal facilities, and port modification projects. In order to take advantage of TIFIA financing, project sponsors must have a reliable source of local revenue to pledge as repayment. For highway and bridge projects, this typically involves charging roadway users a toll. Under the TIFIA, states, localities, public authorities, and some private entities can take advantage of three types of financial assistance including secured loans, loan guarantees, and lines of credit. Other specific requirements must be met including project costs, loan amounts, and project types. TIFIA has a rolling application process, where applicants must submit letters of interest demonstrating creditworthiness and readiness to proceed. After an invitation is received from the TIFIA Joint Program Office, a formal application is required. TIFIA was authorized at $275 million for fiscal years 2016 and 2017, increasing to $285 million in fiscal year 2018 and $300 million for fiscal years 2019 and 2020. [22]

9.4 Federal-aid Matching Strategy: Toll Revenue Credits

Section 120(i) of Title 23 of the United States Code permits states to substitute certain previous toll-financed investments for state matching funds on current federal-aid projects. This provision permits the non-federal share of a project's cost to be met through a "soft match" of toll revenue credits (TRC). TRCs are not “cash” or additional funding, but instead are credits that can be applied to federal aid transportation projects. The flexibility of state transportation finance programs is increased by allowing states to use toll revenues when other state highway funds are not available to meet non-federal share matching requirements. TRC encourage states to increase capital investment in infrastructure and enable them to more effectively utilize existing resources. By using toll revenue credits to substitute for the required non-federal share on a new federal-aid project, the federal share can effectively be increased to 100 percent.[23]
The Northeast Ohio Areawide Coordinating Agency (NOACA) may receive TRC to use at its discretion to increase the federal payable share of projects financed through the Surface Transportation Program (STP) and Transportation Alternatives Program (TAP).[24]
TRC are credits that states earn from non-federal capital expenditures that public or private agencies, such as the Ohio Turnpike, make “to build, improve, or maintain highways, bridges, or tunnels that serve the public purpose of interstate commerce.” Advancement of funding through bonding against the Ohio Turnpike and Infrastructure Commission revenues, that include increased tolls, will result in the ODOT earning a significant balance of credits. These credits have been made available to NOACA funding programs.

ODOT and NOACA TRC requirements are:

ODOT Requirements

- TRC can be applied only to active project phases – no retroactive TRC application to a project phase once federal authorization has been granted
- TRC usage must be recorded in ODOT’s project management system (Ellis) and included in project federal authorization requests
- TRC cannot be applied to State Infrastructure Bank (SIB) loans or Federal Emergency Fund projects
- TRC will not be advanced from a future SFY and cannot be swapped between NOACA or other MPO programs
- TRC can be carried forward until the lapse period specified in the ODOT MPO and Large City Program policy
- Amount of TRC will not be adjusted up or down with annual ODOT budget true-ups
- ODOT will monitor and be the official record for the tracking of NOACA TRC balances

NOACA Requirements

- Approval of TRC will be contingent upon the availability of funding in the current NOACA Transportation Improvement Program (TIP)
- Approval of TRC is subject to the availability of adequate TRC balances for the respective NOACA program as determined by ODOT
- Projects that propose added capacity through expansion of the existing facility will not be considered for TRC in order to be consistent with the NOACA Regional Transportation Investment Policy, which limits these projects to 50 percent NOACA funding participation

The NOACA Board of Directors will consider the approval of TRC to increase the federal payable share for NOACA funded projects and programs, including the:

- Urban Core Communities Projects, which are sponsored by, and located within, communities identified in the current NOACA Urban Core Communities Policy are eligible for 90 percent NOACA funding participation, utilizing 10 percent TRCs.
- Disadvantaged Urban Core Communities Projects sponsored by, and located within, Disadvantaged Urban Core Communities identified in the current NOACA Disadvantaged Communities Policy are eligible for 100 percent NOACA funding participation, utilizing 15 percent TRCs.
- Environmental Justice Areas Projects located within NOACA defined Environmental Justice Areas are eligible for 100 percent NOACA funding participation, utilizing 20 percent TRCs.

[20] The “Special Needs” criteria are published in accordance with 13 C.F.R. § 301.3(a)(1)(iii) and define what may constitute a “Special Need” (as defined in 13 C.F.R. § 300.3) sufficient to make a project eligible for Public Works or EAA investment assistance, as described in Section C.3 of the program NOFO.
[21] FY 2018 Economic Development Assistance Programs NOFO, https://www.grants.gov/web/grants/view-opportunity.html?oppId=306735

[22] Transportation Infrastructure Finance and Innovation Act (TIFIA), https://www.fhwa.dot.gov/fastact/factsheets/tifiafs.cfm and TIFIA Credit Program Overview, https://www.transportation.gov/tifia/tifia-credit-program-overview
[23] FHWA. Federal-aid Matching Strategies Fact Sheet. https://www.fhwa.dot.gov/ipd/finance/tools_programs/federal_aid/matching_strategies/toll_credits.aspx
[24] NOACA (2016). Toll Revenue Credits Policy. https://www.noaca.org/home/showdocument?id=21330

- Transportation for Livable Communities Initiative (TLCI) Studies and implementation projects identified for funding though the NOACA TLCI Program are eligible for 100 percent NOACA funding participation, utilizing 20 percent TRCs.

9.5 State Funding

The Ohio Public Works Commission (OPWC) was created to oversee the State Capital Improvement Program (SCIP) and the Local Transportation Improvement Program (LTIP).[25] Nineteen district integrating committees were created throughout the state to select projects for funding using a merit-based process. SCIP is a grant/loan program for roads, bridges, water supply, wastewater treatment, storm water collection, and solid waste disposal. LTIP is a grant program for roads and bridges only.
OPWC's District One covers Cuyahoga County (the County), and is administered by the District One Public Works Integrating Committee (DOPWIC), which consists of seven (7) members. Through an Administrative Services Agreement, Cuyahoga County Planning assists the DOPWIC in implementing the SCIP and LTIP programs.[26]

State Capital Improvement Program and the Local Transportation Improvement Program

Funding is provided through grants, loans, and loan assistance or local debt support. Grants are available for up to 90 percent of the total project costs for repair/replacement, and up to 50 percent for new/expansion. Loans can be provided for up to 100 percent of the project costs. Grant/loan combinations are also available. There is no minimum or maximum loan amount. The term of the loan cannot exceed the useful life of the project, or 30 years, whichever is less. The minimum term is one year. The district will recommend the rate of interest for each loan in whole percent increments from 0 percent to 3 percent. Loans may be paid in full with no prepayment penalty.
For 2019 Program Year the DOPWIC received 58 applications from 37 applicants, for funds totaling $79.7 million from the Program Year 2019 OPWC State Capital Improvement Program.
The DOPWIC's Program Year 2019 allocation was $29.8 million of which:

- SCIP Grant: $15.3 million
- SCIP Loan: $1.7 million
- Revolving Loan Program (RLP): $5.9 million
- LTIP: $7.0 million

The LTIP Program provides the equivalent of one cent in gasoline tax receipts annually. The use of such receipts is constitutionally limited to roads and bridges only. Counties, cities, villages and townships may apply for the grants to fund up to 100 percent of the project costs.

Project Scoring for State Funding

DOPWIC staff evaluates and recommend scores for all projects' applications using OPWC established criteria summarizes in **Table 16**.

Table 16. Ohio Public Works Commission Project Scoring Criteria

Evaluation/Scoring Criteria	Maximum Points
Infrastructure Condition: ODOT Code (0 to 9)	25
Infrastructure Age	10
Health and Safety Needs	25
Other Project Funding	9
Ability and Effort to Finance	9
Loan Incentive	9
Access to Funds	3
Economic Health	10
Total Points	100

Note: For details on how each criteria is defined and measured refer to DOPWIC State Capital Improvement Program Year 2019 Application Manual at http://www.countyplanning.us/wp-content/uploads/2018/08/DOPWIC_PY2019_-ApplicationManual.pdf
For details on infrastructure condition refer to OPWC's Physical Condition Ratings: http://www.pwc.state.oh.us/Documents/CIRConditionsRating.pdf?v=0

Operations and Maintenance Cost Savings

The current Willow Avenue Lift Bridge annual operation and maintenance (O&M) cost is $300,000 (2019$). The Alternative Access to South Whiskey Island Feasibility Study contemplates four alternatives to rehabilitate or rebuild the bridge. Under alternatives 4, 15 and 16, the annual O&M cost does not change compared with current cost, however, under alternatives 36, annual O&M will be $30,000.

Other State Sources

The Project may request funding for the recreational facilities along the bridge thought the State capital appropriations.

9.6 State Financing: Ohio State Infrastructure Bank

The Ohio State Infrastructure Bank (SIB) is maintained by the ODOT, which is the primary decision maker for the SIB projects. The Ohio SIB was capitalized with a $40 million authorization of state general revenue funds, $10 million in state motor fuel tax funds, and $87 million in Federal Title 23 Highway Funds. The SIB revolving loan program intends to increase the number of delivered transportation projects by leveraging state and federal funding.[27]
Any highway or transit project eligible under Title 23, as well as aviation, rail and other intermodal transportation facilities is eligible for direct loan funding under the SIB.
Loan repayments are made to ODOT and re-loaned to subsequent projects, making it a revolving loan program. Within ODOT, the SIB Loan Committee manages the approval process.
Examples of revenue sources which can be used for repayments include but are not limited to, tax-increment payments, state gas tax, vehicle registration fees, tolls, private donations, local sales tax, non-tax revenues, general obligation, grants, etc.
The City can use their general obligation (general funds revenues) to borrow from Ohio SIB. They have done this before. In 2006, the City secured a 10-year loan of $2.1 million at annual 3 percent interest rate for Fulton Road bridge replacement pledging its annual income taxes for loan repayment.[28] The ODOT' SIB continues to provide 30-year loans in the amount between 15 million to 35 million at 3 a percent interest rate. As of June 30, 2019 the funds available for federal and state eligible projects are $14,020,950 and $4,596,720 respectively. [29] For matching purposes, the Project team would need to work with ODOT to

[25] State of Ohio Public Works Commission: http://www.pwc.state.oh.us/default.html
[26] Cuyahoga County Planning Commission: http://www.countyplanning.us/services/grant-programs/infrastructure-programs/
[27] Ohio SIB website: https://beta.transportation.ohio.gov/programs/programs/state-infrastructure-bank
[28] Ohio SIB Fiscal Year 2006 Annual Financial Report. http://www.dot.state.oh.us/Divisions/Finance/SIB%20Annual%20Statements/2006%20SIB%20Annual%20Report.pdf
[29] Ohio SIB website: http://www.dot.state.oh.us/Divisions/Finance/Pages/StateInfrastructureBank.aspx

make sure the funding does originate from Federal sources, since SIB loan funding comes from both state and Federal sources.

9.7 Local Financing

Both Cuyahoga County and the City of Cleveland borrow funds from either the ODOT or on the municipal capital markets (through issuance of bonds) to fund its capital improvement programs. This section describes the key sources of general fund revenue the County and the City have pledged for debt service. This section also describes limitations imposed by the Ohio law on local borrowing.

Cuyahoga County

The major sources the County's general fund revenues are the property and sales taxes. The two sources constituted 44 percent (or $336 million) and 34 percent (or $256 million) shares respectively in the County's 2018 general fund (total $757 million). The County received $48 million in capital grants and contributions to fund water and sewer improvements which came from OPWC and Ohio Water Development Agency (OWDA) in the form of loan proceeds. In 2017 the County had outstanding loan debt from OPWC which was incurred in 2006 at the amount of $1.3 million to fund Schaaf Bridge. The County also borrowed $5.2 million from ODOT for the Crocker project in 2009. The loans are repaid by property tax collections. [30]
The County pledges its sales and property tax receipts to borrow for capital improvements through the issuance of general obligation debt. These bonds are backed by the pledge of the ad valorem property taxes within the ten-mill limitation imposed by Ohio law to pay debt services. The issuance of general obligation bonds requiring a levy of property taxes above the ten-mill limit would require a vote of the County residents.
The County's Capital improvement Program is focused primarily on funding water and sewer infrastructure improvements. The Willow Avenue Lift Bridge is owned by the City and hence needs to be funded by the City.

City of Cleveland

The City issues general obligation bonds (backed by the City's income and property taxes) and self-supporting revenue bonds (backed by the fees generated by water, airport, parking and other revenue generating projects) to fund its capital improvement program.
In 2017, the City received $452 million in income tax revenues and $52 million in property tax revenues out of the total $630 million in general revenues. City's local income tax is the most significant source of general fund revenues. The income tax receipts constituted 70 percent of the total general revenues while property tax receipts were 8 percent of total general fund revenues.[31]

Income Tax

Ohio law authorizes a municipal income tax both on corporate income and employee wages and salaries at a flat rate of 2.5 percent. This tax is in addition to the Ohio income tax and the federal income tax. The City's income tax collections are divided between the General Fund which receives 8/9th of the receipts, and the Restricted Income Tax Fund which receives the remaining 1/9th share. The restricted income tax portion may only be used for capital improvements or for debt service for obligations issued to fund capital improvements.

Property Tax

Property tax backed general obligation debt may be issued by the City without authorization from the voters within the ten-mill limitation imposed by Ohio law. The issuance of general obligation bonds requiring a levy of property taxes above the ten-mill limit would require a vote of the County residents.
In 2018, the City issued $80.4 million in unvoted general obligation bonds with a coupon rate between 4 percent and 5 percent. The City's general obligation bonds were rated "A1" by Moody's and "AA+" by S&P credit rating agencies. The bond is payable from the pledge of ad valorem property taxes within the ten-mill limitation and municipal income taxes of the City.
The current allocation of the millage in the City is as follows: 4.40 mills to the City, 4.00 mills to the Cleveland Municipal School District and 1.50 mills to the County. Of the 4.40 mills allocated to the City, 4.35 mills are levied for debt service on unvoted general obligation bonds and 0.05 mills is levied for the fire pension obligations. Total 9.95 mills which is within ten-mill limitation.

Local Government Debt Ceiling

Ohio state laws restrict the ability of municipalities to incur debt. The Ohio Revised Code provides that the net principal amount of both voted and unvoted debt of a city, may not exceed 10 ½ percent of the total tax valuation of all properties in a city as listed and assessed for taxation. And then the net principal amount of unvoted non-exempt debt may not exceed 5 ½ percent of that valuation.

9.7 Private Contributions of Funds

In addition to public funding and financing sources, this chapter addresses the question of whether mechanisms exist for private contributions towards the costs of rehabilitation, reconstruction or a complete replacement of the project to fill the gap in public funding. This section considers whether federal and state legislation allows tolling of the bridge. It also reviews a special tax district and in-kind contributions as alternative ways (alternative to tolls) to allow private contributions.
There are three companies –Cargill, Ontario Stone and Sand Products (CSI)– that are the primary beneficiaries of the Project, since the bridge and access road support the industrial sites.

Tolling Option

The following section considers whether the City has an authority to toll the bridge per applicable federal and state laws.

Federal Law Review

Under Title 23 of the United States Code (Highways), there is a general prohibition on the imposition of tolls on Federal-aid highways. The NHS is part of the Federal Aid Highway System. The term "Federal-aid highway" means a public highway eligible for assistance under Title 23, United States Code (USC) other than a highway functionally classified as a local road or rural minor collector. The NHS system for Ohio was developed by ODOT in cooperation with Ohio's MPOs Rural Transportation Planning Organizations (RTPOs), county engineers and other local officials. The current NHS system for Ohio was approved by the FHWA on August 11, 2017. The project study area –the access road and the bridge– is located on the NHS per ODOT published Ohio state NHS system map.[32]
It is important to note that the passage of Public Law 112-141, in MAP-21 in 2012 made significant changes to Section 129 General Toll Program which provided flexibility in imposing tolls on federal-aid highways including tolling eligibilities and agreement requirements.[33]
Under MAP-21, public agencies may impose tolls on federal-aid highways in a number of instances with the following most applicable to the project:

[30] Cuyahoga County 2018 Comprehensive Annual Financial Report. https://fiscalofficer.cuyahogacounty.us/pdf_fiscalofficer/en-US/UnauditedFinancialStmt2018.pdf
[31] City of Cleveland Comprehensive Annual Financial Report: http://www.city.cleveland.oh.us/sites/default/files/forms_publications/2017CAFR.pdf
[32] Ohio DOT website: http://www.dot.state.oh.us/Divisions/Planning/ProgramManagement/MajorPrograms/Pages/RoadwayFunctionalClass.aspx?Paged=TRUE&p_SortBehavior=0&p_FileLeafRef=Defiance%20NHS%20Map%2epdf&p_ID=501&PageFirstRow=21&&View=%7b57FBE863-B082-4E82-A2E5-DF2DB21CD624%7d
[33] 23 U.S. Code § 129 - Toll roads, bridges, tunnels, and ferries: https://www.law.cornell.edu/uscode/text/23/129

- Reconstruction or replacement of a toll-free bridge or tunnel and conversion of the bridge or tunnel to a toll facility; and
- Reconstruction of a toll-free Federal-aid highway (other than a highway on the interstate system) and conversion of the highway to a toll facility.

Based on the fact that MAP-21 allows for *reconstruction or replacement of a toll-free bridge or tunnel and conversion of the bridge or tunnel to a toll facility*, **the conclusion is that there is no prohibition to tolling the access to Whiskey Island from the federal level.**
Application of per truck or per truck load (tonnage-based) fee could allow Cargill, Ontario Stone and CSI to pay for the use of the bridge on an annual basis from their sales revenues rather than as an initial lump sum capital costs contribution. The tolls can be collected and applied towards refunding of the City bonds or support repayment of the USDOT (such as a TIFIA loan program).

Ohio State Law Review

Ohio Revised Code Section 5531.18 permits any governmental agency (including the City) to apply the Ohio Director of Transportation to construct a toll project within the City.[34]
The Ohio Revised Code defines “toll project” in Ohio Revised Code Section 5531.11(N) as being one of the following:

- Any project for which user fees are charged that adds new capacity, including construction on existing highways, bridges, or tunnels where construction increases the total number of lanes, including toll and non-toll lanes, and does not decrease the total number of non-toll lanes at each mile;
- New interchanges;
- Bridges, tunnels, etc. that connect to interchanges and are necessary for safe traffic merging between the toll project and those non-tolled public roads;
- Replacement, improvement, rehabilitation, operation and maintenance of a bridge at a location that carries interstate highways over the Ohio River to another state.

The project *does not fit within one of the four types of projects that are considered valid “toll projects” in Ohio*. Under the current definition of a toll project in Ohio, **the City cannot apply to the ODOT to construct a toll project.**

Special Assessment District

The alternative way for the City to allow companies located on the Whiskey Island to contribute towards project costs is through a special assessment district (SAD). A special assessment district allows a levy on properties located in the district which are the primary beneficiaries of the planned transportation investment. This levy is additional to the existing property tax rate.
Different forms of special assessment districts existing in Ohio, including:

- Transportation Improvement Districts (TID): special assessment on property values paid by the beneficiaries of the transportation project located within the boundaries of the district.
- Business Improvement District (BID) also known as Special Improvement District (SID): special assessment on property values paid by the beneficiaries of economic development/revitalization or other social purpose investments located within the boundaries of the district. The assessment funds are collected by the City and turned over to the BID. The funds are used for services including security, maintenance, sanitation, marketing/promotion, streetscape enhancements, landscaping, and decorative lighting. These services are typically additional to those normally provide by the City. **For this reason, BIDs are not applicable to funding transportation projects**. [35]

Transportation Improvement District

The Ohio Code allows for creation of TIDs as specified in the Ohio Revised Code Title [55] LV Roads-Highways-Bridges of Chapter 5540.[36] A TID may be created by the Board of County Commissioners of a County.[37] There are currently 40 TIDs in Ohio but no TID was registered in the Cuyahoga County. ODOT registers TIDs and provides seed money to help with a start-up.
TID projects are defined as:

“A "Project" means a street, highway, parking facility, freight rail tracks and necessarily related freight rail facilities, or other transportation project constructed or improved under this chapter and includes all bridges, tunnels, overpasses, underpasses, interchanges, approaches, those portions of connecting streets or highways that serve interchanges and are determined by the district to be necessary for the safe merging of traffic between the project and those streets or highways, service facilities, and administration, storage, and other buildings, property, and facilities, that the district considers necessary for the operation of the project, together with all property and rights that must be acquired by the district for the construction, maintenance, or operation of the project.”
TDIs are allowed to:

- “Purchase, construct, maintain, repair, sell, exchange, police, operate, or lease projects”.
- “Issue either or both of the following for the purpose of providing funds to pay the costs of any project or part thereof:

Transportation improvement district revenue bonds

Bonds pursuant to Section 13 of Article VIII, Ohio Constitution

Maintain such funds as it considers necessary”

TID revenues are defined as:

- “Revenues” means all moneys received by a district with respect to the lease, sublease, or sale, including installment sale, conditional sale, or sale under a lease-purchase agreement, of a project, all moneys received by a district under an agreement pursuant to Section 515.03 of H.B. 66 of the 126th General Assembly, Section 555.10 of H.B. 67 of the 127th general assembly, or Section 755.20 of H.B. 153 of the 129th general assembly, any gift or grant received with respect to a project, tolls, special assessments levied by the district, proceeds of bonds to the extent the use thereof for payment of principal or of premium, if any, or interest on the bonds is authorized by the district, proceeds from any insurance, condemnation, or guaranty pertaining to a project or property mortgaged to secure bonds or pertaining to the financing of a project, and income and profit from the investment of the proceeds of bonds or of any revenues…”

Special Assessment are defined as:

- “The board shall levy special assessments at an amount not to exceed ten per cent of the assessable value of the lot or parcel of land being assessed. The board shall determine the assessable value of a lot or parcel of land in the following manner: the board shall first determine the fair market value of the lot or parcel being assessed in the calendar year in which the area to be benefited by the public improvement is first designated and then multiply this amount by the

[34] Ohio Revised Code, Title [55] LV Roads – Highways – Bridges, Chapter 5531, http://codes.ohio.gov/orc/5531
[35] City of Cleveland (2004). “Business Improvement Districts in Cleveland: Establishing a Business Improvement District A Step-by-Step Procedures Manual”. 2nd Edition – September http://planning.city.cleveland.oh.us/maps/pdf/2004BIDManual.pdf
[36] Ohio Code: Chapter 5540: Transportation Improvement Districts http://codes.ohio.gov/orc/5540
[37] The law does not specify any requirement for the property owners to agree.

average rate of appreciation in value of the lot or parcel since that calendar year. The assessable value of the lot or parcel is the current fair market value of the lot or parcel minus the amount calculated in the manner described in the immediately preceding sentence. The board may adjust the assessable value of a lot or parcel of land to reflect a sale of the lot or parcel that indicates an appreciation in its value that exceeds its average rate of appreciation in value."

TID Potential Revenue Yield

The three companies –Cargill, Ontario Stone and CSI– own land, buildings and structures on the island. All three are paying industrial-rate property taxes. Cuyahoga County Fiscal Officer website contains data on the market value, the assessed value, the tax rates and the resulting property taxes for all three companies from 2003 to 2018.[38] A high-level analysis of the potential revenue yield from a special assessment on the current assessed value of the companies' properties on the island was performed. The results of the analysis are summarized in the **Table 17** and **Table 18**. Data on the company's taxable value (i.e., assessed value) was sourced from the Cuyahoga County Fiscal Officer, Online Property Search. The data includes 2018 figures. Figures for 2019 where estimated by applying a growth rate in the assessed value from 2017 to 2018.

Table 17. Cargill, Ontario Stone and Sand Products Total Assessed Value and Rate

Company		2017	2018	2019 (est.)
CARGILL INCORPORATED 2400 SHIPS CHANNEL DRIVE CLEVELAND, OH 44113	Land Value	$949,340	$1,029,320	
	Building Value	$1,425,240	$1,464,230	
	Assessed Value	$2,374,580	$2,493,550	$2,618,481
	Effective Rate	101.570	101.570	
ONTARIO STONE CORP WHISKEY ISLAND DRIVE CLEVELAND, OH 44113	Land Value	$206,080	$224,950	
	Building Value	$77,910	$67,100	
	Assessed Value	$283,990	$292,050	$300,339
	Effective Rate	101.570	101.570	
SAND PRODUCTS CORP RIVERBED REAR CLEVELAND, OH 44113	Land Value	$209,650	$231,950	
	Building Value	$6,690	$980	
	Assessed Value	$216,340	$232,930	$250,792
	Effective Rate	101.570	101.570	
			Total Assessed Value	$3,169,612

Source: Cuyahoga County Fiscal Officer, Online Property Search, https://myplace.cuyahogacounty.us/

The 2018 effective property tax rate, also sourced from the Cuyahoga County Fiscal Officer, Online Property Search was increased over the base 2018 rate by 10 percent, 15 percent and 20 percent. **Table 18** summaries the resulting property tax increments under three options. If leveraged (i.e., used for repayment of a loan) the projected revenue yield from a 30-year TID was estimated to be in the range between $600,000 to $1,200,000.

Table 18. Potential TID Revenue Yield (2019$)

	Effective Tax Rate Increased by:		
	10%	**15%**	**20%**
Total Assessed Value	$3,169,612		
Effective Tax Rate	101.570		
Total Annual Tax Bill (A)	$321,936		
Effective Tax Rate (After Tax Rate Increase)	111.727	116.805	121.884
Total Annual Tax Bill (After Tax Rate Increase) (B)	$354,130	$370,227	$386,324
Annual Funds for the Project (A – B)	$32,194	$48,290	$64,387
Potential Loan (High-level Estimate)	$600,000	$900,000	$1,200,000
2008 -2018 Annual Tax Rate Increase*	1.62%		
City of Cleveland GO Bond Interest Rate**	5.00%		

*Note: * Cuyahoga County Fiscal Officer, Online Property Search*

*** 2018 City of Cleveland Various Purpose General Obligation Bonds, Series 2018*

In-kind Contribution

An in-kind contribution is a non-monetary contribution. In-kind donations may be incorporated into a Federal-aid project. The companies on Whiskey Island could provide material to ODOT at no cost for a limited period in exchange for a rehabilitated or new bridge.[39]

[38] Cuyahoga County Fiscal Officer. https://fiscalofficer.cuyahogacounty.us/en-US/REPI.aspx

[39] USDOT. Office of the Chief Financial Officer. Federal-Aid Guidance for Non-Federal Matching Requirements https://www.fhwa.dot.gov/legsregs/directives/policy/fedaid_guidance_nfmr.pdf

10. Conclusions and Recommendations

Based on the results of the Multi-Criteria Decision Analysis, AECOM recommends **ALTERNATIVE 36 – New Fixed Bridge at State Street** as the preferred alternative. As envisioned, the non-movable State Street Bridge has a length of 2,400', spans 100' above the Old River and has an estimated construction cost of $52 million (2024). Cooperation from NS may allow for improvement in the alignment and profile. Preliminary design of this alternative should be progressed forward to allow full evaluation of environmental concerns and their mitigation. The project seeks to mitigate or improve environmental concerns such as air quality, dust, and noise. Although these are typical byproducts of industrial sites, the project will investigate mitigation or amendment to a reasonable level to improve quality of life for residents in proximity to industry. However, this project cannot address all public concerns such as nearby material stockpiles and the presence of diesel-fueled commercial trucks.

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